PRINCIPLES OF HUMAN GEOGRAPHY

BY

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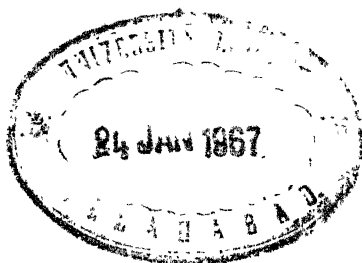
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EDITOR'S PREFACE

P. Vidal de la Blache, who died suddenly on April 5, 1918, in the full vigour of his intellectual power, unfortunately had not been able to complete the present volume. It seemed a pity, however, to deprive geographers of the results of his long years of effort in attempting to classify and to define the principles of human geography.

Conversations with the author and a memorandum sent to the publisher, Max Leclerc, as early as 1905, had made known to us the general plan of the book. But the manuscript pages which we discovered are only a part of the entire work. Part I, which deals with the distribution of population, was the nearest completion. A few chapters, even, had been published in the *Annales de Géographie*.[1] Parts II and

[1] *La répartition des hommes sur le globe* (first article), *A. de G.*, XXVI, 1917, pp. 81–93, substance of Chap. I, General Survey. *La répartition des hommes sur le globe* (second article), *Ibid.*, pp. 241–254, substance of Chap. II, Growth of Population Density. *Les grandes agglomérations humaines* (first article), *Afrique et Asie*, *Ibid.*, pp. 401–422, substance of Chap. III, Great Agglomerations, Africa and Asia. *Les grandes agglomérations humaines* (second article), *Europe, remarques générales*, *A. de G.*, XXVII, 1918, pp. 92–101, substance of Chap. IV, The European Agglomeration. *Les grandes agglomérations humaines* (third article), *Régions méditerranéennes*, *Ibid.*, pp. 174–187, substance of Chap. V, The Mediterranean Region.

III, still in manuscript except for two or three chapters which were in shape for publication, were hardly more than masses of notes and first drafts. To make use of these notes required patient effort in assembling fragments which seemed to belong together, omitting pages which seemed repetitious, often fitting together several different versions of the same topic made at intervals of many years, and, as a guide, using the author's brief indications as to sequence, — suggestions jotted down on the back of the sheet or on a margin. We have refrained from making any changes which might run the risk of being out of harmony with the peculiarly individual style of the author. We have confined ourselves to a choice between his own alternatives, often entangled in a most disconcerting fashion, and to a correction of obvious mistakes which the author would have rectified in copying his manuscript. Throughout this delicate task we have been encouraged by the satisfaction of seeing strikingly original and suggestive ideas emerge from the page of manuscript hardest to decipher. Unless we are greatly mistaken, most of the chapters are a homogeneous whole. Very few are obviously incomplete.

At least one chapter in Part I is lacking, that dealing with the American Agglomeration. In Part III the author would most certainly have discussed cities at length. On this subject we have collected only a few pages, — a mere introduction or summary, as it were. We have placed these "Fragments" at the

end of the book, together with several topics for which it was impossible, try as we might, to find room in previous chapters.

Just as any rewriting of the text has been sedulously avoided, so we gave up the idea of making or completing the drawings, of which there were many. While some of them were partly finished, others were hardly more than suggested. There are certainly fewer illustrations than Vidal de la Blache would have wished. But we have at least reproduced the four large planispheres which he had himself studied in the greatest detail.

In a word, nothing essential is lacking. The book is unquestionably the master's work, full of vitality and richness of thought.

What seems to us most novel in these pages, in comparison with the best published work on anthropogeography, or human geography, is not so much the astonishing erudition or the wealth of examples from a great variety of countries, as the way in which the historical point of view penetrates, dominates and inspires the examination, classification and explanation of all the facts. I think no one has tried, to the same degree, to look at the present phenomena of human geography as mere stages in a long evolution. Vidal de la Blache surveys them in the past and in the future simultaneously. And his glance embraces the most remote past. He does not merely constantly refer to history, properly so-called. He

goes back into prehistoric times as well. He studies attentively the primitive peoples which, from our point of view, are merely witness to long-forgotten ages, and in their culture, which seems rudimentary to us, he sees the progress made during the first ages of human existence. Man himself is always considered as the final stage in the evolution of certain living species, loosed, as a reward of long-protracted effort, from the matrix of his animal nature. The author's manner of explaining and commenting upon the commonest events of life, such as way of living, or living together, means of sustenance, transportation or exchange, gives the impression of an intellect which has succeeded in placing itself outside humanity, as it were, in order to estimate and to appreciate its achievements.

This lofty, historical preoccupation does not prevent the geographical point of view from dominating the study of every topic. Analysis always ends in a location of types or in pointing out local connexions.

Geographers as well as historians and sociologists will read and re-read with profit these pages into which Vidal de la Blache put the quintessence of his thought, — the fruition of a lifetime of study and meditation which gradually, more and more, came to be focussed upon human geography.

EMMANUEL DE MARTONNE

OCTOBER, 1921

TRANSLATOR'S NOTE

Principes de Géographie Humaine has been translated in order to make accessible to English and American readers the work of a great scholar. Vidal de la Blache carries authority as founder of the modern French school of geography. Most of the leading French geographers of the present time were his pupils. He trained a generation. His voluminous writings are the *vade mecum* of geographers, yet not useful to them alone. Historians, economists, anthropologists, geologists also find their thinking illuminated by his point of view toward the interaction of man and his environment.

Vidal de la Blache surveys the world, past and present, with a breadth of grasp which is unique. In the editor's preface M. de Martonne has referred to the master's detached attitude toward the universe. His style is an outgrowth of it. It is so peculiar, so essentially his own that it cannot be paraphrased, even in French, without losing much of its quality. Primarily it is suggestive, with sudden, far-off vistas. At times it is so crystal clear that a distant glimpse has the distinctness of a cameo. At other times it is obscure, though always suggestive. Frequently it is just such "*pensées flottantes*," as they have been

described by one of his disciples, that are the most suggestive of all. When an attempt is made to convey this subtlety in English prose, the precious aroma floats off, and the words clumping along upon the earth hardly more than hint at the elusive thoughts hovering above.

Secondly, his writing is vivid. He personifies inanimate objects, for one thing. His active verbs make them take on a gait entirely foreign to their usual passive state. The result is an aggressive, militant style. As often as possible I have used the exact word he used, even when it wrenches the literal, scientific mind. If, however, it sounds merely bizarre and exaggerated, while his use of it was quaint and full of meaning, I have tried to find an equivalent equally picturesque idea. It has been a constant struggle between a desire to preserve the vivacity of the literal, and the need of getting back to Anglo-Saxon, — for it is the Anglo-Saxon word which gives life, and life is a first characteristic of the style of Vidal de la Blache.

The defects of the book are obvious. But it has been thought best not to attempt to edit it at all. As M. de Martonne did not alter the original manuscript, so it has been left in translation as it was written. There are paragraphs already out of date, such as those referring to world railway-mileage, or to the probable influence on world commerce of the opening of the Panama Canal. There is occasional repetition of phrases, even of entire sentences, as on

pages 176 and 454. Furthermore, the accuracy of certain statements may be open to question. For instance, on page 37, from the fact that because "according to the census of 1910" there was a "slight decrease in the population of Iowa between 1900 and 1910," the author infers that "there seems to be no tendency to exceed" the moderate density of fifteen to twenty inhabitants per square kilometre in the Middle West. (Compare also page 414.) Iowa is the only state in that region which has ever shown any decrease throughout a series of years, and during the following decade, 1910 to 1920, it showed an increase as elsewhere. (Population of Iowa in 1900, 2,231,853; in 1910, 2,224,771; in 1920, 2,404,021. *Fourteenth Census of the United States taken in the Year 1920*, Vol. III, Population, 1920. Washington, 1922, p. 314.) The population of the entire Middle West is still steadily increasing.

The translator has made no corrections, however. Occasional lapses such as the above are of slight consequence in comparison with the sweep of thought which bears us along on its world-wide quest.

A few footnotes still remain unverified. These refer to publications not contained in the Library of Congress, the New York Public Library or the American Geographical Society Library.

For English spellings of geographical names the atlas published by the *London Times* has been used whenever possible. Many of the names, however, are so little known that regional works have been

the only source of authority, in spite of the fact that their diversity of spelling is bewildering.

Though my indebtedness is great to many authorities in many fields, it is greatest of all to my husband, Walter Van Dyke Bingham, whose help in finding the one inevitable, elusive word has been unfailing.

MILLICENT TODD BINGHAM

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I. CRITICAL EXAMINATION OF THE CONCEPT OF HUMAN GEOGRAPHY

Human geography is a recent sprout from the venerable trunk of geographical science. If it were merely a question of terms nothing could be less novel, for the human element is an essential part of all geography. Man is interested in his own kind more than in anything else. As soon as the age of travel and distant voyages opened, it was the discovery of social as well as environmental differences which chiefly excited his interest. What Ulysses retained from his travels was "the knowledge of cities and the customs of many men." To most of the early authors who wrote about geography the notion of country was inseparable from that of inhabitants, — the food-supply and the appearance of the population were no less curiously foreign and unaccustomed than the mountains, deserts, and rivers which made up their environment.

Human geography, therefore, is not to be contrasted with a geography from which human interests are excluded. Indeed such has never existed except

in the minds of specialists. But our science offers a new conception of the interrelationships between earth and man, — a conception resulting from a more synthetic knowledge of the physical laws governing our earth and of the relations between the living beings which inhabit it.

Human geography is the expression of a growth of ideas rather than the immediate, one might almost say material, result of discovery and the extension of geographical knowledge.

It would seem as if the new light shed upon the entire surface of the earth during the sixteenth century might have given rise to human geography in the real sense of the word. But such was not the case. Manners and customs, to be sure, do play a large part in the narrations and compilations which that age has bequeathed to us. But emphasis was laid upon the extraordinary and bizarre, when not upon mere anecdote. There was no principle of geographical classification underlying the various types of societies described. Those who try to reconstruct pictures or "mirrors" of the world by using data of such a nature are no more dependable than Strabo. In regard to human phenomena necessarily included in descriptions of countries, Bernhard Varenius, — whose *Geographia generalis*, written in 1650, was the most remarkable work up to the time of Ritter, — used phrases showing an almost contemptuous condescension on his part. And so, though knowledge about the most varied types of peoples

had been increasing throughout two centuries of discovery, nothing resulted which was either clear-cut or satisfying from the point of view of scientific classification.

Nevertheless, scientific thought had long been attracted by the influences of the physical world upon human society. It would be unjust to a line of scholars reaching from the first Greek philosophers to Thucydides, Aristotle, Hippocrates and Eratosthenes, to forget the ingenious and often profound ideas which are often expressed in their writings. How could the varied and ever-widening spectacle of the external world fail, after reasonable reflection upon the progress of human societies, to awaken an echo in the philosophical schools that sprang up along Ionian shores? There were certain sages who, like Heraclitus, true predecessor of Bacon that he was, thought that man, rather than confine the search for truth to the contemplation of "his own microcosm," would do very well to widen his horizon and seek truth from the "great world" of which he is a part.[1]

These wise men began by seeking in physical environment the explanation of whatever was particularly striking in the character of the inhabitants. Then, as observations on the march of events and of societies accumulated with the passage of time and broadened in scope, it became more and more evident

[1] Francis Bacon, *De Dignitate et Augmentis Scientiarum*, Book I, § 43.

just how much importance should be attached to geographical causes. The reflections of Thucydides upon archaic Greece, and of Strabo upon the location of Italy, are traceable to the same intellectual traits as certain chapters of the *Esprit des lois* or of Henry Thomas Buckle's *History of Civilisation in England.*

Ritter is also inspired by similar ideas in his *Erdkunde*, but he writes more as a geographer. Though he assigns a special rôle to each great continental country because of traces of historical bias, he nevertheless does regard the interpretation of nature as pivotal. For most historians and sociologists, on the other hand, geography exists only for purposes of consultation. One starts from man in order to come back by a detour to man once more. One pictures the earth as "the stage upon which man's activities take place," without reflecting that the stage itself is alive. The problem consists in enumerating the influences affecting man, in an attempt to discover in how far a certain kind of determinism is operative in the events of history. Important and interesting questions, surely. But answers to them require a knowledge of the world wider and more profound than any available until recently.

II. THE PRINCIPLE OF TERRESTRIAL UNITY AND THE CONCEPTION OF ENVIRONMENT

The dominant idea in all geographical progress is that of terrestrial unity. The conception of the earth as a whole, whose parts are coördinated, where phe-

nomena follow a definite sequence and obey general laws to which particular cases are related, had early entered the field of science by way of astronomy. In the words of Ptolemy, geography is "the sublime science which sees in the heavens the reflection of earth." But the conception of terrestrial unity was long confined to the domain of mathematics. It did not become part of other branches of geography until our own day, and then largely through the knowledge of circulation of the atmosphere which governs climatic laws. More and more we have come to accept certain generalisations with reference to the world organism. Friedrich Ratzel very wisely insists on such a conception, making it the corner-stone of his *Anthropogeographie*.[2] The phenomena of human geography are related to terrestrial unity by means of which alone can they be explained. They are everywhere related to the environment, itself the creature of a combination of physical conditions.

Botanical geography has been largely responsible for light thrown upon such a conception of environment, but the light reaches far beyond, embracing the geography of all living creatures. Alexander von Humboldt, with his usual foresight, pointed out how important is the appearance of vegetation in determining the character of a landscape, and when H. Berghaus, inspired by him, published in 1836 the

[2] *Anthropogeographie, Zweiter Teil, Die Hologäische Erdansicht*, Stuttgart, 1891.

first edition of his *Physikalischer Atlas*,[3] the close relationship between climate and vegetation was clearly brought out. This fertile idea opened the way for a new series of researches. Classification of species became less important than a survey of the entire plant life of a region, made in such a way as to show how the influence of environmental conditions such as soil, temperature and humidity, manifests itself.

The general appearance of vegetation is certainly the most characteristic feature of a region. Absence of it is striking. When we try to recall a long-forgotten landscape, no particular plant such as palm or olive-tree comes to mind, but the ensemble of all the various plants which make up vegetation as a whole. They not only accentuate land-forms, but give to the landscape by their shape, colour, bulk and manner of grouping, a common, individual character. Steppe, savanna, silva, park lands, open forest and gallery forest (sparse woods skirting streams in steppe-areas) are collective terms which give an idea of such an ensemble. It is not a question of a mere pictorial impression, but rather of a certain character resulting from the very functions of the plants as well as from their physiological requirements.

This fact has been demonstrated by analysis and by comparison from mere observation and from experimental research in botanical geography, espe-

[3] 3d. edition, Gotha, 1892.

cially since such research has been extended to include different altitudes in both tropical and temperate regions. The rivalry of plants among themselves is so active that only those best adapted to the environment are able to survive. Even so, only a state of unstable equilibrium is maintained. Adaptation finds expression in different ways, in the height, size, and position of leaves, hairy covering, fibrous tissue, root development, etc. Not only does each plant provide as best it can for the carrying on of its own vital activity, but many different plant-associations are formed so that one may profit by the proximity of the other. Whatever the variety of species living side by side, whatever the external differences in processes of adaptation, the entire plant population has a common stamp not to be mistaken by a trained eye.

Such is the lesson of ecology, for which we are indebted to researches in botanical geography: ecology, or in words of the author of the term,[4] the science of "the correlations between all organisms living together in one and the same locality and their adaptation to their surroundings." For it is obvious that these relations include not plants alone. Animals, of course, with their powers of locomotion and man with his intelligence are better able than plants to cope with the environment. But, when one considers all that is implied in this word "environ-

[4] Ernst Haeckel, *The History of Creation*, New York, 1876, Vol. II, p. 354.

ment," and all the unsuspected threads of which the fabric which enfolds us is woven, how could any living organism possibly escape its influence?

In conclusion, these researches result in an essentially geographical concept: that of environment as composite, capable of grouping and of holding together heterogeneous beings in mutual vital interrelationships. This idea seems to be the law governing the geography of living creatures. Every region is a domain where many dissimilar beings, artificially brought together, have subsequently adapted themselves to a common existence. If the zoölogical elements which have entered into the formation of a regional fauna are considered, its heterogeneous character is clearly apparent; it is composed of representatives of widely different types, which circumstances, — always difficult to define with accuracy, but inherent in the struggle for existence, — have brought to the region. And yet these organisms have adapted themselves to it; and if, among themselves, they are more or less hostile, they are none the less dependent upon one another for their very existence. Even islands, if they are sufficiently large, are no exception to the rule. Zoö-geographers use such expressions as "community of life" or even "faunal association," significant terms, which show that for animals as for plants, every area with a given relief, location and climate, is a composite environment where groups of elements, — indigenous, ephemeral, migratory or surviving from former

ages, — are concentrated, diverse but united by a common adaptation to the environment.

How far are these facts applicable to human geography? We shall try to discover an answer to this question.

III. MAN AND ENVIRONMENT

But before proceeding further, one point must be briefly considered. Botanical geography is based upon an imposing array of observations and researches: zoölogical geography, although far less advanced, has profited by much fruitful exploration. What facts are at the disposal of human geography? What is their source of origin? Are they numerous enough to warrant conclusions of which we have already had a glimpse?

In the study of relations between earth and man the perspective has changed. We are looking at them from a greater distance.

Heretofore, only historic times have been under consideration, which include merely the last act of the human drama, a period of time exceedingly short in comparison with the life and activities of man on earth. Prehistoric research has shown that man has been established since time immemorial in widely diverse parts of the globe, equipped with fire and fashioning tools; and however rudimentary his industries, the modifications that the face of the earth has undergone because of them cannot be ignored. The paleolithic hunter and earliest neolithic agricul-

turists destroyed certain species of animals and plants and favoured others. That these hunters and agriculturists operated independently of one another, in different localities, is proved by the various methods of making fire still in use. Man has influenced the living world longer and more generally than has been supposed.

Because the human race was so early and so widely distributed, there are many degrees of adaptation. Each group discovered helps as well as obstacles in the particular environment where it had to establish itself; the different ways of meeting them represent just so many local solutions of the problem of existence. But at a moment when continental interiors were being made accessible and scientific explorers were systematically observing their inhabitants, a heavy curtain fell and concealed the various developments. The influences of environment are seen only through masses of historical events which enshroud them.

Direct observance of forms of life closely in touch with their environment is a recent result of systematic observation of the most isolated and backward families of the human race. The services rendered to botanical geography by analysis of extra-European floras, as we have seen, are precisely the same as those to which human geography is indebted through knowledge of peoples still close to nature — the *Naturvölker*. However much weight is given to exchanges, there is always, nevertheless, a marked

endemic quality which explains how certain individuals, under certain definite natural conditions, went about organising their existence according to their own lights. Is it not upon such foundations that civilisations, which are, after all, only accumulated experience, have been built? While developing and becoming more complicated, they have not entirely lost contact with their origins.

Many of these primitive forms of life are ephemeral; many are extinct or in process of extinction. True. But they leave as witnesses products of local industries, — weapons, implements, clothing, etc., — all the various objects in which their relation to surrounding nature materialises, so to speak. It has been wise to collect such objects, to found special museums for them, where they can be grouped and geographically coördinated. An isolated object means very little; but collections from a given locality have a common stamp, and give a direct and vital impression of the environment. So ethnographical museums such as that founded at Berlin by the indefatigable enthusiasm of Bastian, or those of Leipzig and other cities, are veritable archives where man may study himself, not in the abstract, but by means of concrete examples.

Another sign of progress is that we are better informed at present as to the distribution of our kind, we know more accurately how large the populations in different parts of the earth really are. I would not say that there is an exact census of the

human race, and that the figure 1,700,000,000 accurately represents the sum-total of our fellow-creatures; but it is certain that thanks to soundings made almost everywhere in the human ocean, thanks to frequent censuses and to trustworthy estimates, figures are available which are accurate enough to use as a basis for inference.

Considering the instability of relations between living beings, the numbers and territorial distribution of each species has great scientific value. It throws light upon the evolution of occupation. Human population is a constantly changing phenomenon. This is most plainly in evidence when, in addition to statistics with reference to particular states, general distribution throughout the world is taken into account. There are regions so over-populated that the inhabitants seem to have utilised all possible space. There are others where population has remained small and scattering, when neither soil nor climate seems to justify the anomaly. How can such differences be explained except as the result of currents of immigration which originated in prehistoric times and of which only geography can discover a trace? And naturally these neglected areas are becoming a focus of attraction for present day migrations.

One of the most suggestive relationships is that between number of inhabitants and any given area, in other words, density of population. If detailed statistics of population are compared with equally

detailed maps, such as are available in almost all the principal countries of the world today, it is possible, by analysis, to find a connexion between human groups and physical conditions. Here we touch upon one of the basic problems of human occupation. For the existence of a dense population, — a large group of human beings living together in the smallest space consistent with certainty of a livelihood for the entire group, — means, if one stops to think of it, a victory which can only be won under rare and unusual circumstances.

Today transportation facilities minimize the difficulties which our forebears encountered in forming compact groups where they happened to be. And yet, most existing groups were formed in ancient times; an analysis of them reveals their genesis. In reality the population of a region is composed, as Levasseur has well shown,[5] of a certain number of scattered nuclei, surrounded by concentric zones of decreasing intensity. It gathers about centres or along lines of attraction. Population did not spread like a drop of oil; in the beginning it grew in clumps, like corals. Reefs of population collected at certain points by a sort of crystallisation process. These populations, by their intelligence, increased the natural resources and the value of such places, so that other men, whether voluntarily or under compulsion, came to share in the advantages of the inheri-

[5] E. Levasseur, *La répartition de la race humaine* (*Bulletin de l'institut intern. de statistique*, XVIII, 2, p. 56).

tance, and successive layers accumulated on the chosen spot.

We now have anthropological data in regard to some of the countries where human alluvium has been thus deposited. Central Europe, the Mediterranean basin and British India [6] are for different reasons examples from which it is possible to gain some idea of the composition of peoples. In a general way, their complexity strikes us most. When an attempt is made, with the most trustworthy anthropological data available, to discover the elements of the population, not only of a large region, but even of a small one, lack of homogeneity is found to be the rule almost without exception. In France anthropologists have discovered very ancient elements dating back to prehistoric times, side by side with recent arrivals, often within a single region or even a single department. Why some places should contain more heterogeneous elements than others is easily explained by their nature and location. But in the present stage of development of human occupation, regions which seem to have entirely escaped waves of invasion that have swept over the surface of the earth are very exceptional, — only a few distant archipelagoes and mountain-fastnesses. Even in the African jungle tall Negroes and lighter-skinned pygmies live side by side in mutual relation-

[6] *Le peuple de l'Inde d'après la série des recensements* (*Annales de Géographie*, XV, 1906, pp. 353–375 and 419–442).

ships. In spite of current usage which confuses the terms "people" and "race," the fundamental distinction between them can henceforth be considered established. Beneath similarities of language, religion and nationality, the specific differences implanted in us by an ancient descent never cease to be operative.

Nevertheless, all such heterogeneous groups blend in a social organisation which makes of the population of a country a unit when looked at in its entirety. It sometimes happens that each of the elements of this composite whole is well established in a certain mode of life; some as hunters, others agriculturists, others shepherds; if such is the case, they coöperate with and supplement one another. It most often happens, except for certain obstinately refractory units within our European societies, such as gypsies, gitanos, zingani, etc., that the sovereign influence of environment has forced all into similar occupations and customs. There is material evidence of this uniformity. Such is the coalescing power which blots out original differences and blends them in a common type of adaptation. Human societies, like those of the vegetable and animal world, are composed of different elements subject to the influence of environment. No one knows what winds brought them together, nor whence, nor when; but they are living side by side in a region which has gradually put its stamp upon them. Some societies have long been part of the environment, but others are in process of

formation, continuing to recruit members and to be modified day by day. Upon such, in spite of all they can do, surrounding conditions leave their impress, and in Australia, at the Cape, or in America, these people are slowly becoming saturated with the influence of the regions where their destinies are to unfold. Are not the Boers one of the most remarkable examples of adaptation?

IV. MAN AS A GEOGRAPHICAL FACTOR

As a result of the particularism of the earlier geography, certain broad, general concepts in regard to the relationships between earth and man are beginning to appear. Population distribution has been guided in its development by the proximity of land masses to one another. Ocean solitudes long divided inhabited countries (*oikoumenes*) and kept them in ignorance of one another. Throughout the continents widely separated groups met with physical obstacles which only time could overcome; mountains, forests, marshes, waterless regions, etc. Civilisation recapitulates the struggles against such obstacles. The peoples which surmounted them were enabled to profit by the results of a collective experience gained in a variety of environments. Other communities, on the other hand, because of prolonged isolation, lost the initiative which had inspired their early progress. Incapable of raising themselves by their own efforts above a certain level, they suggest certain animal communities which seem to have com-

pleted the utmost progress of which they are capable. Today all parts of the earth are interrelated. Isolation is an anomaly which seems like a challenge. Contacts are no longer between contiguous or neighbouring areas, as heretofore, but between widely separated regions.

Physical causes, whose value geographers have been fond of pointing out, are not without influence on this account; it is always necessary to note the effect of climate and relief, as well as of continental or insular position, on human societies. But we should observe their effects on man and on the whole of the living world conjointly.

In this way we are in a position to better appreciate the rôle which should be assigned to man as a geographical factor. He is at once both active and passive. For, according to the well-known phrase, "*natura non nisi parendo vincitur.*"

An eminent Russian geographer, Woeïkof, has noted that the objects over which man has control are chiefly what he calls "movable bodies".[7] Upon that part of the earth's crust modified by the mechanical action of surface agencies such as running water, frost, winds, the roots of plants, the transference of particles by animals and the constant tread of their feet, lies a residue, the result of decomposition, constantly being renewed and prepared for use, capable of being modified and of taking on

[7] A. Woeïkof, *De l'influence de l'homme sur la terre* (*Annales de Géographie*, X, 1901, p. 98).

different forms. In the most thankless wastes of the Sahara the dunes still show traces of vegetation and of life. Human activity finds greater opportunity in regions where this movable material is abundant than in those where a calcareous carapace, for example, or a clayey crust, has made the surface hard and sterile.

But it must be remembered that the earth itself, to use Berthelot's phrase, is "*quelque chose de vivant.*" Under the influence of light and of forces whose mechanical action is unknown, plants absorb and decompose chemical substances, and bacteria fix the nitrogen of the atmosphere in certain plants. Life, transformed as it passes from organism to organism, circulates through multitudes of living beings: some manufacture the substances by which others are nourished; some carry germs of diseases which destroy other species. Man utilises not only inorganic agencies in his work of transformation. He is not content merely to make use of the products of decomposition in the soil by ploughing, nor to utilise the waterfalls, the force of gravity brought into play by inequalities of relief. He further collaborates with all living forces grouped together by environmental conditions. He joins in nature's game.

The game is not free from chance. It is important to note that in many parts of the world, if not in all, climatic conditions are not as fixed as the means printed on maps would seem to indicate. Climate is

a resultant of various forces and oscillates about a mean rather than holding to it. The still far from complete data in our possession have at least made clear the fact that such oscillations seem to be periodic in character, in other words, that the swing continues for several consecutive years, first in one direction, then in another. Series of rainy years alternate with dry series; and even though these variations do not cause great damage in regions where rainfall is sufficient, the reverse is true in regions with only the necessary minimum. The implication in this remark is clear, for man by his intervention can reinforce the positive factor, establish, as it were, a permanent state upon a temporary one, — permanent, at least, until a new order of things.

For example: from North Africa to central Asia observers are struck by scenes of desolation in contrast to remnants of cultures and ruins which give evidence of ancient prosperity. The latter rested upon the fragile support of irrigation-works, thanks to which man was able to obtain a constant supply of water. If the beneficent function were interrupted for a while, all the enemies vanquished by irrigation would regain control. And what is far more serious, processes of adaptation would take another course. Other customs would prevail among men; their existence would depend on other means of livelihood, on other creatures with other territorial requirements. The forest has no greater adversary than the shepherd, while dykes and canals have an im-

placable enemy in the Bedouin, whose wanderings they obstruct.

Man's activities gain their chief effectiveness from the allies they mobilise in the living world — cultivated plants and domestic animals; for, in this way, inherent energy is freed, which, thanks to man, finds an outlet and proceeds to act. Most of the plants assembled by agriculture are species which formerly were widely scattered: such, for instance, as plants clinging to sunny slopes or along the banks of streams, overpowered by competition with more numerous, vigorous species, and allowed to remain only in certain places. From the favourable stronghold where they were thus entrenched, these plants, destined some day to receive the blessing of grateful men, lay waiting for the moment when new circumstances should allow them more space. Man, by making them part of his own clientèle, did them this service by setting them free. But simultaneously he opened the way to a whole procession of uninvited plants and animals. New groups took the place of those which had occupied the space before his arrival.

Without man's help, cultivated plants, at present characteristic of certain parts of the earth, would never have been able to win from rival species the space which they now occupy. Should it be inferred that if man withdrew his support, the species at whose expense the present incumbents have gained ground would once more assert their rights? Nothing could

be less certain. For it may be that a new natural economy has had time to replace the old. When tropical forests disappear they are succeeded by brushland; and this change, by modifying light conditions, eliminates in part the creatures living in the forest, especially formidable insects (*Glossinae*) which kept away other species. Elsewhere great areas of underbrush such as *maqui* or *garigue* [8] have replaced forests. Other trains of events have taken place, transforming the living environment as well as economic conditions. A new field, almost illimitable in extent, seems to open for observation and perhaps for experiment. In studying the influence of man upon the earth, and the scars which occupation, often of very long standing, has already made on its surface, human geography has a double aim. It not only has to take account of the destruction in which man may or may not have shared, one which has enormously reduced the number of great animal species since the Pliocene period, it is finding also, by a more intimate knowledge of the relationships which make a single unit of the entire living world, a means of thoroughly investigating the transformations taking place at the present time as well as those which can be foreseen in the future. In this respect, present and future undertakings of man, henceforth master of distances, armed with all that science places at his disposal, will far exceed any

[8] See *Oecology of Plants*, Eug. Warming, Oxford Press, 1909, p. 304.

influence that our remote ancestors could exert. Let us congratulate ourselves, because the task of colonisation which constitutes the glory of our age would be only a sham if nature set definite, rigid boundaries, instead of leaving a margin for the work of transformation or reparation which it is within man's power to perform.

PART I

DISTRIBUTION OF POPULATION

CHAPTER I

GENERAL SURVEY

I. INEQUALITIES AND ANOMALIES OF DISTRIBUTION

In order to understand the relationships between earth and man, the first question to be answered is this: how is population distributed over the surface of the earth? Or, to be more exact, how dense is population in different regions? It is assumed, although the criterion is not infallible, that man, whether plentiful or scarce, whether living in dense or sparse colonies, makes upon the soil a mark more or less permanent, according as to whether his rôle is more or less active. In any event, his activities are not everywhere the same.

Official statistics do not satisfy the geographer. There must be additional data from various sources, because the question as to how far human occupation of the earth has progressed up to the present time must be answered by comparison of occupied areas with those available. All parts of the earth's surface must be taken into account, not entirely out of the question today, in spite of incomplete knowledge. Only in its entirety is the fact significant, because of the differences, the contrasts and the anomalies disclosed in such a comprehensive view. The anomalies themselves are suggestive. The unoccupied terri-

tory and lack of continuity within the distribution-area of a given species, whether man or any other living species, are no less instructive than the actually settled areas.

The population of the earth in 1913 was estimated at 1,631,517,000.[1] The resulting mean density for the entire earth would therefore approximate eleven inhabitants per square kilometre, — which is a mere guess, because, between the maximum density attained by advanced civilisations, and the minimum for rudimentary groups, this figure can not indicate any permanent stage in the development of countries in process of colonisation. But how is population distributed? Two-thirds of all the inhabitants on earth are concentrated in one-seventh of its area.[2] Europe, India, China proper, and the Japanese archipelago alone have more than 1,000,000,000 inhabitants. In this group of countries, each separated from the others, and long without any direct intercommunication, all the large agglomerations have been formed. One other, to be sure, has advanced with giant strides during the last century. In 1910 the United States had more than 101,000,000 inhabitants. However, this does not amount to one-fourth the population of Europe, though the areas are almost equal.

[1] Otto Hübner's *Geographisch-statistische Tabellen*, 62 Aufl., Frankfurt-am-Main, 1913.

[2] Europe, 448,000,000; India (exclusive of Burmah and dependencies), 302,000,000; China proper, 326,000,000; Japan (exclusive of dependencies), 52,000,000.

If countries situated north and south of the equator are compared, differences are even more striking. It is true that land-areas in the temperate zone are far from being as extensive in the southern hemisphere as in our own; but if the population of southern Brazil, the La Plata states, Chile, Cape Colony, Australia and New Zealand were compared with that of corresponding equally advantageous locations in our own hemisphere, the figures would be markedly disproportionate, in spite of a recent increase which is gradually shifting the balance. The land-area of the south temperate zone is approximately 15,000,000 square kilometres, or about one and one-half times the area of Europe, and estimates of their present population are not more than twenty-six to twenty-seven millions.

The above figures are tending more and more to equalise; but the equalisation is still a long way off, — if it is ever to be reached at all. Before the unprecedented European emigration during the nineteenth century, a phenomenon which is a turning-point in the evolution of human occupation, the distribution of population did not differ in the least from what can be observed today in, say Madagascar, where more than one-third of the population is crowded into one-twentieth the area of the island.

Are such discrepancies justified by natural conditions? Increase of population always encounters serious obstacles, many of them insuperable. These

obstacles may be superabundance of vegetable and insect life which stifles human effort, as in equatorial jungles, or insufficiency either of moisture or of heat, which somehow impoverishes all means of livelihood. On the other hand, a benign climate and an abundant natural food-supply are favourable circumstances. Following de Candolle's example, attempts have been made to list food-crops according to origin. If the Mediterranean region and India are among the most advantageous localities, the Sudan also should be included among them, and it has never noticeably contributed toward an increase in world population. A more dependable criterion would be ease of acclimatisation in certain climates: one, for example, where a warm, rainy season of from four to five months follows winters of moderate temperature and rainfall, making it possible for two cycles of plant life to be completed within a year, consequently two harvests for man. The transformation of the landscape of southern Japan during May and June is a marvel to Europeans. The noisy merry-making of the harvest is followed in the twinkling of an eye by the silent activity of seeds newly planted in the ground. Such a climate, characteristic of the monsoon regions of Asia, has most certainly stimulated man to great fecundity; but has it done so everywhere?

Another favourable type of climate, though less benign, perhaps, is that which, after the winter interlude, has a period of at least six months of

temperatures above 10°C., with sufficient rainfall. This is long enough to allow considerable margin for acclimatisation; few cereals could not adapt themselves to it, and many fruit-trees and vegetables can do so. This happy type of climate, with its compensations and its guarantees against the danger of famine, which was the nightmare of ancient human societies, was certainly one of the most propitious circumstances of their development.

None of the above causes can be ignored, yet none in itself is sufficient. Human affairs are fraught with uncertainty. Adjoining favourable environments where population has increased, are others whose influence is weak or negligible; beside overpopulated Bengal are thinly-settled Assam and Burmah; beside Tonkin is Laos. And, until the last century, what was the Mississippi Valley, whose climate, with spring and early summer rains, in the words of A. W. Greely,[3] is "one of the great bases on which rests the national prosperity of this great republic"? A hunter's domain. Even though now agricultural, it has a density of less than twenty inhabitants per square kilometre, — in striking contrast to Europe.

The same anomalous inequality appears in frontier-regions occupied by man only when pushed to it, doubtless under pressure of neighbouring peoples.

[3] Tennessee type; Missouri type. (A. W. Greely, "Rainfall Types of the United States," *National Geog. Mag.*, V, 1893, p. 47.)

Our race has established outposts at high altitudes, in deserts and in arctic solitudes. This spread of mankind in spite of cold, drought and rarefied atmosphere shows a defiance which is verily one of the most remarkable evidences of its command over nature. Into regions which would seem to be prohibitive man has advanced notwithstanding; but not always at the same rate of speed. The impetus which has driven him beyond his natural boundaries has operated differently in different regions.

Uninhabited areas are most extensive in the northern hemisphere and in the Old World; yet they are relatively less unoccupied than the arid parts of America and Australia. Man has succeeded in establishing himself wherever he could gain the least hold. Because of recent explorations which have penetrated the innermost recesses of the continents, we are able with some accuracy to draw a line around the regions where man appears only by stealth and as a fugitive. Arabia has its Dahna; Persia its Kévir and its Karakum; Turkestan its Taklamakan; Tibet its gloomy plateaus where one can travel for weeks without meeting a human soul. The eastern Sahara in the Libyan desert, even with its oases, and the western Sahara in Tanesruft, are deserts in the true sense of the word. But except for these entirely God-forsaken regions, man has taken possession of the arid parts of Africa and Asia. Wherever a foothold is possible, there a population is established. If there is a trickle of water, or if its presence is

even suspected, man, awaiting his opportunity at such fortunate spots, has driven wells and built ditches, often extending them by indomitable and ceaseless effort, determined to succeed in spite of climatic discouragements. He must fight if he is an agriculturist; he must fight also if he is a shepherd, wandering from one grazing ground to another as each in turn becomes exhausted, — a condition reached all too soon. It is said that Tuareg tribes, though few in number, are, even so, too numerous for the resources of the region they inhabit.[4] If, then, there are regions where it is surprising to find too few inhabitants, there are others where it is surprising to find too many, — and with good reason.

High altitudes are not unlike deserts in this respect. At five thousand metres the pressure of a column of air has already diminished by half, and sources of vital heat are exhausted in the rarefied atmosphere; nevertheless, at four or five hundred metres below this altitude in Tibet, little stone hamlets and primitive agriculture begin to appear. At almost as great a height upon the plateaus of Peru and Bolivia, there are mining establishments and small cultivated plots. Permanent occupation reaches the greatest altitudes in dry climates free from heavy fogs and equatorial humidity. It flourishes at an elevation of between two and three thousand metres

[4] F. Foureau, *Documents scientifiques de la Mission saharienne (Mission Foureau-Lamy)*, Vol. II, Paris, 1905, p. 840.

upon the tropical plateaus of the arid districts of Mexico, as well as in Abyssinia and in Yemen. There is no difference in this respect between Old and New Worlds. High plateaus were even preferred as the locus of American civilisations. But in the mountains of the temperate zone events took a different course. The pasture-belt, next above that of forests, is often frequented in Pamir, the Alaï and the Tian Shan, by Kirghiz shepherds at heights of more than four thousand metres. At lower altitudes, though sometimes above three thousand metres, are the *yaïlas*, domains where the pastoral life of Kurds and Turcomans has become established. Finally, the word "Alps" was used by the ancients as a synonym of high regions and pasture-lands. This systematic use of high altitudes for economic purposes had no equivalent until our own day in the Rocky Mountain parks or the *paramos* of the Andes, though the failure to make use of such regions could not be justified by climate or even by fauna. To be sure, man occupies these heights only intermittently; but the expansive force of humanity in such marginal belts is measured by the extent of migrations and the territory covered by them.

The most obvious disparity, however, is that between north and south, between continental and oceanic hemispheres, — the Arctogaea and the Notogaea of certain zoölogists. The existence of a series of peoples adapted to the environment along almost

the entire land-front surrounding the North Pole, from the Chukchi peninsula to Lapland, from Greenland to Alaska, is a remarkable phenomenon. These peoples make up for their lack of numbers by the scope of their migrations. Traces of temporary dwellings have been found in Greenland north of the eightieth parallel. At such latitudes occupation can have no fixed boundaries. Ceaseless wandering is the law of existence for man as well as for animals. There is an ebb and flow in this human tide which washes the inhospitable shores of the North Polar regions. No trace of this expansive energy, of this power of conquest, is found in the extremities of continents nearest the South Pole. The climate can not have been more unfavourable. Quite the contrary. Halting places between Tierra del Fuego and the Antarctic continent were not lacking; the distance of seven to eight hundred kilometres between them would not have been too great for navigators such as the Eskimo. And yet no human trace has been found in the interior of the relatively sheltered fjords of Graham Land at the same latitude as Iceland. Effort has flagged in spite of opportunity and the relative inferiority of mammals in the southern hemisphere seems to have included man.

It is plain from the preceding that the distribution of population is not to be explained by advantages of location. Any skilled observer of climates and soils who tried to estimate therefrom the density of

population would be liable to error. A farmer's method of estimating his probable harvest from the character of his land is no technique for the geographer. Many anomalies warn us that the present distribution of the human race is merely temporary, a result of complex causes in a state of constant flux.

In a single comprehensive glance we can now arrive at an approximate estimate of the number of human beings distributed very unevenly over the surface of the earth. The present distribution is only a stage, not even a stable one, in an evolution whose progress we can not at present altogether understand. Some of its causes are permanent, some no longer active, others just beginning to function. The present result is essentially provisional and subject to change; nevertheless, it is an end-product, and as such supplies a vantage point from which it is possible to observe the march of events in retrospect and perhaps even to hazard some predictions as to the future.

On this point, however, extreme caution is necessary. In the eighteenth century an opinion was expressed that the earth could support three billion inhabitants at the outside. If this were true, it would be necessary only to double the present population, — as population doubled in Europe in the nineteenth century, — for the total to be exceeded. Judging by the active colonisation of several new countries, we are tempted at present to believe that we are on the

way toward a much higher total. We may very well be mistaken in overestimating the size of future populations, just as our predecessors were inclined to underestimate the possibilities. There is no reason for supposing that there is a normal density for similar types of regions, reached already by some, and toward which others are advancing. Thirty or forty years ago one of the most fertile regions in the world, the prairies in the central United States, attained almost at one bound a population of sixteen or seventeen millions; this figure represents a density of but fifteen to twenty inhabitants per square kilometre, much less than that of the agricultural regions of Europe. According to the census of 1910, there seems to be no tendency to exceed it.[5]

Contemporary civilisation has set in motion side by side with causes which favour increase of population, others which would tend rather to decrease it. As the former had greater influence during the nineteenth century, it may well be that the latter will take the lead in the generations to come.

II. THE POINT OF DEPARTURE

One might suppose that the present uneven distribution of population was due to an early stage of development. Certain places where man is a recent comer may not have as yet as large a population as their resources would warrant because the rising hu-

[5] There was a slight decrease in Iowa between 1900 and 1910.

man tide was slow in reaching them. Such a view, however, is not supported in facts, for man seems almost everywhere to have been an ancient guest.

Recent researches in widely separated and dissimilar parts of the earth have given evidence, — either in the form of skeletons or of manufactured articles, — of the almost universal early presence of man. Systematic investigations in North America have led to the conclusion that Quaternary man was pretty generally distributed over that continent. There is no lack of evidence of early occupation in South America, Cape Colony, or Australia, — in parts of the world, that is, which might be considered backward. It is an acknowledged fact that even in the so-called paleolithic period, when the glaciers which had invaded parts of the continents had not yet completed their final retreat, humanity had already made an advance which, among higher classes of living creatures, is a unique geographical phenomenon. The area of occupation had increased to such a degree that man was found almost everywhere. This quasi-ubiquity, so to speak, was a privilege shared, or about to be shared, by certain animals of his household, notably the dog, his early acolyte.

Such "early and wide diffusion," [6] to use Darwin's expression, presupposes a superior mentality; it proves that man had long been endowed with intellectual and social aptitudes which could assure him

[6] Charles Darwin, *The Descent of Man*, Vol. I, Chap. VII, p. 226, New York, 1872.

of success in the struggle for existence. When that was certain, and not before, began the task with which we are here concerned, — the geographical accomplishment of man. Thenceforth the ways of geography depart from those of anthropology. It is the task of anthropology to try to discover by what successive additions and improvements, — with occasional losses, — had man come into possession of such precious social and intellectual gifts. But we can cast only a hurried glance at questions of origin. The actual moment when man had spread over the whole earth marked not the beginning but the end of a long previous evolution.

At a time when neither climate nor the distribution of land and water was exactly as it is at present, he appears to have been already long established as to fundamental characteristics, with a quantity of common traits greatly in excess of differences. However interesting it may be to find in Australian or Negrito a want of development in the spinal column, and more slender legs, such differences are trivial in comparison to the quantity of physical and moral resemblances which tie the members of the human race together and make of them a whole.

I can speak only in passing of recent ethnographical investigations of widely dissimilar peoples. Underneath all environmental differences there still exists an impression of unity. How can the fact be explained that in spite of such differences, there are so often likenesses and convergence between widely

separated regions? The chief preoccupations of existence, particularly concerning death, disease, and immortality, ideas which may be regarded as the sad and universal portion of mankind, have given rise to rites, superstitions, graphic and plastic symbols, masques or statuettes,—an entire stock of similar ethnographical material. There is a primitive groundwork common to almost all early races. Man has fitted, squared, and built up blocks, or simply piled stones over graves always with the same idea in mind. He constructed lake-dwellings on piles in Switzerland and in New Guinea. Could not such resemblances be explained by mutual exchanges? For, even at great distances, intercourse has never been entirely lacking. But exchanges between arid countries on opposite sides of the equatorial zone, or between tropical regions separated by oceans, seem very improbable. How many centuries were required, even in Europe, for the use of iron, which was common along the shores of the Mediterranean, to spread to Scandinavia! The hypothesis of exchange, when supported only by such similarities, is unwarranted. It should be borne in mind that our ideas and our habits have been built upon a substratum older and deeper than we know.

The widespread distribution of the human race took place by way of routes which we have no means of discovering. Whether there was a single centre of dispersal or a number, which at best must have been somewhat limited, man must have had before

him wide unbroken areas in which to expand. A scattered distribution would indeed have been incompatible with large-scale migrations. It is as a terrestrial being with powers of locomotion in keeping with his organic structure, that he was able to cover distances which would astonish us did we not know of what primitive peoples are capable. Oceans did not until later become auxiliaries for human migrations. It is noteworthy that tribes living beside the sea, even those inhabiting archipelagoes, like the Negritos scattered along the southern coasts of Asia, remained in ignorance of maritime life. The art of navigation progresses slowly. It was for long in the possession of but a few, and cannot be counted among the primitive inventions which everywhere hastened the distribution of mankind.

When Europeans pushed their discoveries and their observations far enough to include the entire surface of the earth, they found many tribes ignorant of the use of sails, others which made no pottery, a still larger number to which metals were unknown; but the use of fire was part of the common heritage. Articles showing traces of fire accompany the most ancient human finds. The great variety of methods of making fire, — rubbing, striking, or other special methods, — indicates that this discovery must have taken place independently in different parts of the world. It is not impossible that the invention was first achieved in a tropical region having a dry season. When we are told how upon a layer of dry, inflam-

mable leaves, the natives of Africa collect glowing sparks which they have caused to burst forth by rubbing a piece of soft wood with a pointed stick, it seems as if we were observing one of those crucial experiments which led to the preservation and transportation of fire. The climate in which a carpet of dried underbrush and hard wood, — that is, fuel and match, — are found together, would seem to be the environment most favourable to this invention. In such an environment, doubtless, lived the unknown Prometheuses who first succeeded in appropriating the infinite power hidden within a kindled spark.

The widespread distribution of primitive man was due to his possession of this implement. Fire was not only a weapon of offense and defense against animals, rivals with which man had to dispute the right to live; it also gave him light and cooked his food. By means of it he could accommodate himself to almost any climate, and procure a greater variety of foods. He was freer to move about within the living world.

It is true that such populations formed but a very thin and scattered layer. A comparison with present tribes, whose manner of living resembles that of the primitives, gives some idea of the mean density of those ancient populations. The number of inhabitants beyond the Arctic circle or in sub-tropical deserts is so small as to be negligible. Near the sixtieth parallel north there is a series of peoples with a rel-

atively stable civilisation, whose chief means of support comes from hunting and fishing, though some few practise agriculture and raise live stock on a small scale. Chukchi, Tungus, Jakut, Samoyeds, Lapps, etc., wander about in this wilderness of forests, steppes and tundras in northern Asia, — a landscape not unlike that in which our paleolithic ancestors hunted reindeer in central Europe. Their wanderings are determined by the migrations of the animals, and by the necessity of moving in small groups. Such existing conditions are analogous to those in the remote past. They favour sparse occupation, as the distribution of the Eskimo proves, and thus support the facts disclosed by prehistoric archeology. Such a social state is a lesson in archaic life. Attempts have been made to estimate in round numbers the population [7] along the northern girdle of the continents over an enormous distance. The most trustworthy estimates do not reach a total of 500,000; this does not amount to even one per square kilometre; all together they would not equal the population of even one of our second-class cities. In like manner must vast spaces have been occupied during that period, already critical for the future of the living world, when man, armed with fire, entered, a new champion, into the arena.

Not that there were no human settlements what-

[7] See particularly the estimates of Kurt Hassert, *Die Nordpolargrenze der bewohnten und bewohnbaren Erde*, (*Petermanns Mitt.*, XXXVII, 1891, pp. 151–152; map, pl. 11).

ever, even at that early stage. Fishing, more than hunting, was the occasion of their development. Some of the kitchen-middens along the shores of Denmark, where débris of birds and wild animals is mixed with piles of fish-bones and mollusk-shells, are not less than 400 feet long, 120 feet wide and as much as 8 feet high.[8] They date from a time when man had no implements except bone or chipped flint, and no domestic animal except the dog. Abundance of food, as well as the dimensions of the piles, indicate that relatively large groups lived there. The sea, where it touches coasts or banks favourable to life, is a great provider. Eye-witnesses have described the scenes at low-tide along the coasts of Southern Chile. Not only men and women, but dogs, pigs and screeching sea-birds hurry toward the provender left by the ebbing tide, — toward the table daily spread by nature for all her guests.

Coast-fisheries presuppose a relatively settled population, therefore greater density. In very ancient times this mode of life attracted to the coasts of Japan a population of skilled fishermen living on raw fish. Even today they constitute one-twentieth of the total population of the Empire of the Rising Sun. This pursuit may also have been the cause of high density in southern China. Along the coasts of British Columbia American ethnologists have noted that the tribes engaged in fishing, —Nootka, Tlinkit, Haida, — have a much greater density than the Al-

[8] National Museum of Copenhagen.

gonquin in the interior of the continent, who live by hunting.[9]

Such facts are the first link in chains not subsequently broken, — significant effects of social differences already characteristic of those remote ages.

But let us not exaggerate. Iceland, still somewhat archaic on account of isolation, may serve as an illustration. Set in mid-ocean as a pillar of refuge for living creatures in air and water, fish find shelter in its fjords, sea-birds on its rugged cliffs, — a retreat for spawning and nesting. Half a century ago this seething mass of animal life still included the great auk (*Alca impennis*), now extinct, whose remains are found in kitchen-middens. Human settlements, likewise, have gravitated toward this rendezvous, particularly toward the west coast, bathed as it is by warmer currents. Although population is sparse in the interior, the coast-settlements continue to grow. But what is the maximum density in this narrow littoral band? About nine inhabitants per square kilometre. Probably this is also the maximum which could have been looked for in primitive times.

It is self-evident that in vast tracts within which a handful of men wandered about, certain favoured spots did attract and hold together a greater number of people than others. But that early maximum density would be a minimum under present condi-

[9] J. W. Powell, *Indian Linguistic Families, Seventh Annual Report of the Bureau of Ethnology*, 1885–86, Washington, 1891.

tions. Natural advantages alone, without man's help, could not have produced a greater density.

It is well to inquire whether this thinly distributed human race was able to exert any perceptible influence upon the face of the earth. A slave of natural conditions, was man in a position to modify them? One should not perhaps too hastily answer in the negative. Fire can be used in many ways: there is no proof that its only use was to kindle fires in temporary camps, such as blackened the ground wherever a band of nomads halted for a few days. Like the domestication of the dog, the idea of clearing open spaces comes from a need for security, one which seems to have been felt from the very beginning, even in the smallest human establishments.[10] For want of implements large enough to fell trees, fire was the means of destroying such parasitic growth, of clearing the soil about an encampment, and of doing away with the possibility of ambush and surprise attacks.

Forests receive no protection from atmospheric humidity, if periodically interrupted by long months of drought. Brush-fires which impressed Hanno, the navigator, along the coasts of Senegal, are still frequent well within the interior of Africa. The ashes of certain plants provide salt, an essential seasoning for food. Grass is finer and more savoury, and is more sought after by antelopes after burning,

[10] See Part II, Chap. V.

— a process which also improves the soil. And if the hunter gained thereby, it does not mean that his companions, both male and female, who already had made a practise of gathering edible seeds, had failed to take account of the fact. Sowing seed on burned-over ground in order to reap two or three harvests, is one of the nearly universal practises of primitive agriculture. It is naturally associated with the hunter's life, — as among the tribes of Gond, Bhil and others frequenting the grassy plateaus of central India.

Undoubtedly many parts of the earth have thus far escaped any noticeable modification because they are still untouched by man. But this has not been the case everywhere. Vegetation has been attacked in the most sensitive spot, so to speak. The shrinking of forested areas both north and south of the equatorial zone is a fact which strikes the trained observer. Various types of underbrush in regions which are now treeless, and of aërial lianas which have become half subterranean in order to adapt themselves to new conditions of life, seem to indicate that a part of the immense area now occupied by savannas was formerly forested. At a few degrees' distance from the equator, the forest, driven from plateaus and hillsides, takes refuge in valleys and ravines. Climate alone is not responsible for such a retreat. Many remains of the stone-age, in the Futa-Jallon and western Sudan, for example, indicate that man has had his share in the destruction.

In such regions unfolded the first act in his blind, merciless struggle against the forest, — a struggle which is not yet over.

Human efforts were aided by the powerful herbivorous fauna developed during the Miocene period. Observers in central Africa have been staggered by the enormous herds of antelopes, which at certain seasons of the year become a devouring horde, their fleet and delicate legs spreading their ravages far and wide. Immense quantities of herbaceous fodder must have been needed to feed these herds of kiangs, onagers, horses and wild elephants, as well as the bisons which, up to 1870, could be counted by tens of millions upon the prairies of the United States. Grass will spring up again in the next shower, but young sprouts of trees are destroyed. In the never-ending struggle between grass-lands and forests, these herbivorous hordes, of which only remnants remain, had an immense influence. Later on, man had to fight them in order to protect his crops; but in the beginning they helped him clear the land.

CHAPTER II

GROWTH OF POPULATION DENSITY

I. GROUPS AND GROUP AREAS

Since the remote ages when the human race first spread over the continents, it has gained little in areal distribution. Additional territory to be occupied within historic times is almost negligible, — a few islands in the Atlantic, and more particularly in the Indian Ocean and the South Seas. It is not surprising that the Mascarene Islands, though only one hundred and fifty leagues distant from Madagascar, should have remained a haven of refuge where the dodo (*Didus ineptus*) lived in peace until the recent arrival of man — and dogs. The human flood has finally engulfed all such bits of land, but recent conquests by the *oikoumene* are confined almost entirely to such meagre additions as these. On the other hand, population has increased in density to an incredible degree, although not uniformly. What it has lacked in breadth, it has made up locally in depth, so to speak.

In order to coöperate, it is necessary to combine, because division of labour is a first necessity. But difficulties present themselves when united forces attempt to work together. Such was the dilemma facing the more primitive societies, just as it faces the

most advanced civilisations today. There is no difference in kind between the two, only differences of degree. Irrespective of the importance of the groups themselves, man acts and is geographically significant only in groups. He modifies the surface of the earth in groups. Even in regions where the population seems to be most homogeneous, it appears, on closer scrutiny, to be composed of a multitude of groups, or living cells, like those of the body, which have a life in common.

Molecular Groups. These groups are manifestly dependent on the nature of the country. As plants become stunted for lack of heat or moisture, so also do human communities under similar conditions. Among the Eskimo a dozen huts constitute a considerable settlement, and north of the seventy-fifth parallel the largest consists of but two or three. A group of fourteen yurts is an important village in the province of Anadyr.[1] Aridity in the Sahara or Kalahari Desert, or in Australia, has the same effect as extreme cold. Among the Tuaregs, for instance, Foureau notes "an endless sub-division into little groups of inhabitants."[2] In the Aïr (Asben) settlements are limited to three or four tents.[3] Though

[1] A. Silnitzky, *La province d'Anadyr* (*Sibérie orientale*) *et son administration* (*Rev. sc.*, fourth series, XI, 1 and 8 April 1899, pp. 391–402, 426–433).

[2] F. Foureau, *Documents scientifiques de la Mission saharienne* (*Mission Foureau-Lamy*), Vol. II, Paris, 1905.

[3] *Missions au Sahara*, by E.-F. Gautier and R. Chudeau, Vol. *Sahara soudanais* by R. Chudeau, Paris, 1909, p. 64 *et seq.*

the *kraals* of the Hottentots contain sometimes more than a hundred dwellings, the encampments of Bushmen or Australians consist of hardly a dozen.

Elsewhere, in the equatorial African jungle, for instance, and in the *montaña* or forests of the eastern slopes of the tropical Andes, the importance of human establishments[4] is inversely proportional to the luxuriance of vegetation. In the Congo, between the equator and 6° north and south, villages usually consist of about thirty huts, while settlements of but eight or ten are not uncommon.[5] These figures would doubtless not be exceeded in the interior of Borneo or Sumatra. But the difference between regions where climate is too generous and those where it is too miserly, is shown by the rapidity with which settlements increase in regions just outside the tyranny of the forest. Along the fringes of the forest quantities of villages, both large and small, spring up as if by magic.[6] Population within the forest increases on approaching the savanna, and the latter is itself dotted with villages containing hundreds, sometimes as many as a thousand inhabitants.[7]

[4] See Part II, Chapter V.

[5] Dr. Herr, *Mission Clozel dans le nord du Congo français* (1894–1895) (*Annales de Géographie*, V, 1895–1896, p. 316).

[6] C. A. M. C. d'Ollone, *Mission Hostains-d'Ollone*, 1898–1900. *De la Côte d'Ivoire au Soudan et à la Guinée*, Paris, 1901, p. 306. The author speaks of "the amazing density of forest population near the borders."

[7] J. Bertrand, *Le Congo Belge*, Bruxelles, 1909, p. 86.

Nomadic Groups. Nomadic groups, whatever their mode of life, bear a definite relation to a given amount of space. It is within neither reason nor experience that a people should exist without roots, that is, without a domain in which to carry on its life activities, one which will insure and provide for its existence. Even a group on the lowest rung of the social ladder possesses, and lays fierce claim to its own territory. It is said that the humblest Australian tribes had the habit of indicating by stones or other well-known marks, the regions whose area would be sufficient to meet their needs for hunting and the gathering of wild plants, in addition to furnishing the necessary wood and water. Since quantity must compensate for lack of quality, it follows that the poorest groups usually require the most space.

But a low density of population does not necessarily mean poverty and weakness. The pastoral tribes of Asia and the Sahara have their appointed pastures which they visit in succession on their periodic migrations. Such grazing-lands have a name and a recognised status, unlike the wide, boundless reaches of *bled* (open country). Sometimes months go by without their being visited by their owners; for grass must be given sufficient time in which to grow during their absence. Though solitary and unclaimed much of the time, these regions are, nevertheless, a domain, a dependency of the group. Some of these groups, especially in the heart of the desert,

are rudimentary and insignificant. But such is not always the case. Certain tribes of the eastern Sahara have ramifications extending from Egypt far into central Africa. The Larba, in their periodic migrations between Msab and the markets of Boghar and Teniet-el-Had,[8] cover about 500 kilometres. Another long march is that of 6500 Kirghiz from the valleys of Fergana to the high plateaus of the Alaï. A certain degree of areal organisation is taken for granted in such migrations. The fate of such migratory wealth, measured in hundreds of thousands of sheep or goats, — not including donkeys, horses and camels, — cannot be left to chance. It presupposes adequate provision for the journey, — water-supply, halts, whatever is required for fullest systematic enjoyment of a vast pastoral domain. The journey cannot be predetermined with entire precision; a certain leeway is necessary, because the seasons' vagaries have to be reckoned with. If need be, scarcity of forage at certain places must be provided for. These devastating herds need wide horizons at their disposal, grazing in turn upon the *dayas* or *redirs*, grass in the bed of the wadi, or upon the aromatic clumps of vegetation in the steppes, — annual plants devoured almost as soon as they appear, — even falling back, if need be, upon the uncultivated parts of bordering territory. Only once in a while can they all foregather; they must be widely

[8] Augustin Bernard et N. Lacroix, *L'évolution du nomadisme en Algérie*, Alger et Paris, 1906, p. 89; see also p. 68.

scattered in order to live. Abraham and Lot pastured their flocks at opposite points on the horizon. Only on solemn occasions, heralded with rejoicing, can the tribe permit itself to gaze upon its own splendour, and deploy, like Israel before Balaam, the multitude of its tents. And so, any intensive occupation of the soil is impossible in pastoral life; or, rather, any section given over to intensive occupation cannot expand without serious injury to the shepherd.[9]

Group-relationships. With respect to density of population, tropical silva, grassy savanna, pastoral steppe, all have their expression in different types of grouping with very unequal areas at their disposal. But since all these groups are parts of a terrestrial whole in which man is the driving force, they influence one another. Because of business transactions or other movements back and forth, there is a tendency to increased density along the lines where different modes of life come in contact. We have noted the increase in population near the zone of contact between jungle and savanna in Africa. The same phenomenon can be observed in the Old World along the undefined margin between pastoral and agricultural domains, as well on the desert boundaries of the Tell and of the Sudan, as along the borders of the steppes of western Asia. Markets,

[9] I have shown elsewhere how the extension of pastoral domains is not necessarily conditioned by physical causes, but may quite as well be the result of encroachments. (*Les genres de vie dans la géographie humaine, Annales de Géographie*, XX, 1911, p. 298.)

sometimes cities,[10] spring up at these points of contact, or rather of welding, for such zones are bonds between divergent groups. Indeed if one were to ask how the great pastoral organisations which gravitate from the Sahara well into Mongolia ever came into existence, or endured once they had been created, one would find that their very existence depended upon agricultural markets which enable them to exchange their produce. Dispersal on the one hand, concentration on the other, seem to be related facts.

Pastoral pursuits, carried on today throughout wide stretches of territory in Australia and in America, strengthen such contacts, and at the same time develop them into a sort of system. In regions devoted to pastoral activities such as the Great Basin of North America, the southern Pampa of the Argentine, and the western part of New South Wales, the contrast between a meagre labour-supply and an abundance of pastoral capital is most marked. The disproportion between amount of live stock and of men is far greater than in the Old World. Five or six sheep to a man is the customary number owned by the powerful pastoral tribes of which we have been speaking, whereas in Australia, flocks of from 50,000 to 80,000 head require the attention of from but fifteen to twenty persons. *Estancias* in the Argentine Republic possess flocks numbering as many as

[10] Note, for example, the recent development of Merv, with its two weekly markets. (Karl Futterer, *Durch Asien*, Band I, *Geographische Charakter-Bilder*, Berlin, 1901, p. 6.)

160,000 head. Again, there were in the state of Wyoming, U. S. A., in 1900, more than 5,000,000 sheep and less than 150,000 inhabitants.[11] Throughout large areas, therefore, the human element is reduced to a minimum, but only because commercial centres exist elsewhere, mighty foci of consumption, ports and enormous cities serving as outlets for these meat- and wool-producing districts. Such contrasts are inherent in the general economy.

Storehousing. When he wished to characterise peoples in a rudimentary state of civilisation, merely vegetating, without hope of progress, Virgil said that "they know neither how to garner their stores, nor how to hoard the gathered grain."[12] It would be impossible to put one's finger more exactly on the principle underlying an increase in population density. Sedentary life in itself adds stability to occupation of the soil, directly or indirectly. Agriculture was the only mode of existence which, at the outset, enabled men to live together in a given place and there accumulate the necessaries of life. He is no farmer who, after burning the grass and scattering a few handfuls of seed, takes his departure, but he who harvests the crops and stores them away. In arid regions the shepherd, at the mercy of the elements, tries to feed the greatest possible number of

[11] TWELFTH CENSUS OF THE UNITED STATES TAKEN IN THE YEAR 1900, *Statistical Atlas*, prepared under the supervision of Henry Gannett, Washington, 1903, pl. 148.

[12] "*Nec componere opes norant, nec parcere parto.*" (Æneid, Book 8, 317.)

animals without making provision in advance. The hunting tribes of North America were not ignorant of agriculture, but, as Powell says, "it was the almost universal practise to waste great quantities of food by a constant succession of feasts, in the superstitious observances of which the stores were rapidly wasted and plenty soon gave way to scarcity and even to famine."[18] The farmer does not make such mistakes; foresight, avarice, even, are in his blood. He is guardian of the heritage of past and future generations. His first step was to acclimatise plants and domesticate animals; ensilage or storage in granaries was the second.

Centres of Density and Intermediate Tracts. In Africa the cultivated lands of the Sudan occupy a good deal of space. But the inherent weakness in the agricultural system of this region is that it uses neither plough nor fertilizer. The only places under cultivation are those where the soil is so mellow that turning it over with the hoe is sufficient to cover the seed. Sandstone and granite soils are too arid. And yet, under favourable conditions, this type of agriculture is capable of supporting a considerable population. Junker and Emin-pasha vie with one another in describing "the rows of huts following one upon another for nearly an hour" in the Uganda. Hans Meyer speaks in similar terms of the crops which cover the terraced hillsides of Ruanda to a height of

[18] J. W. Powell, *Indian Linguistic Families, Seventh Annual Report of the Bureau of Ethnology*, 1885–6, Washington, 1891.

1600 metres. At lower altitudes along the Middle Shari, A. Chevalier describes that region as one vast orchard. In the Nigerian Sudan, says Lucien Marc, there are "regions where one can walk for two days without losing sight of native huts."[14] E. Salesses estimates the population of certain districts in the Futa Jallon at 40 per square kilometre. Only, such centres of density are sporadic; they are separated by open tracts of unoccupied territory.

Unable to supply losses from exhaustion of the soil, each group soon finds itself cramped for space. Though the soil is described as fertile, it seems imperative, nevertheless, that a village should control an area three times as large as that actually under cultivation.[15] An alternation of crop and fallow maintains vast reserves of waste land near those used for agricultural purposes. But in spite of such caution, the time comes when the overpopulated district finds it necessary to dispose of some of its inhabitants. And what happens then? The superfluous individuals are not banished to a near-by district, but to a considerable distance, far beyond the natural boundaries of the region.[16]

[14] Lucien Marc, *Le Pays Mossi*, Paris, 1909, p. 115.

[15] Auguste Chevalier, *Mission Chari-Lac Tchad*, 1902–1904, *L'Afrique Centrale Française, Récit du voyage de la mission*, Paris, 1907, p. 250.

[16] In the fertile valley of the Niger, each village cultivates around itself a suburban area whose radius may be as much as 1500 to 1800 metres. "When the number of inhabitants increases, the number of houses does not increase. A colony is

Such is the explanation of journeys across vast open tracts, day after day of marching without a glimpse of a hut or a human face, the sad refrain of exploration in Africa. Wars and the slave-trade have undoubtedly helped to increase such uninhabited areas; nowhere is the truth of the expression *homo homini lupus* more apparent. But if the social group has remained detached, molecular, incapable of concerted action for defense, an inadequate type of agriculture must be held responsible. Scenes full of contradiction pass before our eyes and alter our estimates of total population.

The earth has been settled bit by bit, each tiny speck the centre of an ever-widening circle. In the most civilised countries the circles eventually overlap, though not always. Richthofen, in his diary of travel in China, notes traces of an ancient, fundamental separation[17] between neighbouring and highly civilised provinces like Hupeh and Honan. Partitions between the chambers, great and small, of which China is composed, — to use his expression, — are mountainous or rugged border lands, whose inhabitants, divided into clans, live in little hamlets, with manners and customs differing from those of the plain. The two populations, though adjacent,

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ejected to a distance of two or three kilometres, which then founds a little village bearing the same name as the first." (G. J. Toutée, *Du Dahomé au Sahara . . .* , Paris, 1899, p. 122.)

[17] *Ferdinand von Richthofen's Tagebücher aus China.* Ausgewälht u. hrsg. v. E. Tiessen, Band I, Berlin, 1907, p. 437.

do not mix. It is obvious that they have nothing in common.

India "is more a collection of fragments than an ancient society complete in itself," says Sumner Maine. With the exception of the half-wild settlements surrounding it in Bengal and in the country of the Mahrattas, the Hindu village, typical of the civilisation of the North, is organised so as to be self-supporting, just as if no other existed. An agricultural unit, with its appointed quota of functionaries and artisans, it constitutes an independent microcosm. An analysis of the last census shows that most individuals remain confined to one spot, unless they marry into a neighbouring village. Villages are not isolated from one another, but groups of villages from tribes, so true is it that the influence of geographical conditions functions through social causes!

Groups Established in Europe at Different Dates. The present population of most of Europe is so composite that large-scale maps are often needed to distinguish the lines of junction along which different groups were finally welded into an apparently homogeneous whole. The shores of the Mediterranean, even so, and even on medium-scale maps, show curious breaks in continuity. Within a few miles the population falls from a high degree of density to a density so low that it resembles that of the desert. In Spain, *campos* lie next to *huertas*, in Languedoc, *garigue* next to *coustière*, the *plans* of the Var next

to the basins of Grasse and of Cannes, the half desert Murgia next to the populous coast of Pouilles. In the Peloponnesus, the little plains of Argos, Achaia, Elis, Messenia and Laconia, which comprise only one-twentieth of the total area, contain one-fourth of the inhabitants. City-life and clan-life are different growths, both of which have found a favourable environment near the Mediterranean; and they still survive, side by side. This fact has helped to establish and to maintain among the various primitive groups an interdependence unfortunately lacking in such parts of the coast as the Rif, Albania and the two Syrtes (Gulf of Sidra and Gabes), where commerce and urban life have been unable, up to the present time, to take firm hold.

Big industry has upset conditions in central and western Europe during the last century. A thousand years of history had made their entries and erasures on the record of population. Draining of marshes and clearing of forests were continually adding new touches to the original background. Different types of establishment have had different origins, a fact so patent that the merest glance is enough to show the difference between ancient village-areas and those settled more recently, where farm-hamlets are scattered over heaths (*brandes*) and cleared land (*essarts*). But when the industrial age began, it gave birth to a whole new set of human establishments.[18]

And yet, the primitive core of the population can

[18] See Part II, Chap. V.

still be discovered. On positive evidence it can be stated that men, here as elsewhere, persisted in assembling in certain places rather than in others. But where? Such places were not always the most fertile, but usually the most easily cultivable, — calcareous plateaus of Swabia, Burgundy, Berry, Poitou, etc.; mellow, friable lands forming a sort of band from southern Russia to northern France, where forests have had difficulty in gaining a foothold since the glacial period. Such, for instance, were the clearings, the wide open spaces, attractive sites of the first European settlements, where men began to gather, to cohere and to become powerful. Interesting cartographical studies have been made in Würtemburg,[19] with the help of prehistoric finds and cadastral surveys. In non-forested districts Roman and Alemannic settlements were superposed exactly upon those of the neolithic epoch and the first iron age. Occupation of the intervening spaces has but recently begun. Obviously the same thing must have occurred in France. When M. Jullian pictures the territory of a Gallic people as "a vast region . . . with cultivated fields in the centre, protected on the outskirts by continuous barriers, either forests or marshes," etc.,[20] he gives an accurate description

[19] Robert Gradmann, *Die ländlichen Siedlungsformen Württembergs* (*Petermanns Mitt.* LVI-1, 1910, pp. 183–186, 246–249; 4 maps, scale 1/1,000,000, pl. 31; 6 reductions of cadastral surveys, scale 1/5,000, pl. 40).

[20] Camille Jullian, *Histoire de la Gaule*, II, *La Gaule indépendente*, Paris, 1908, p. 16.

of one of these original basic units. On the same principle I have myself attempted to make a map showing the historical growth of occupation in France and central Europe.[21]

II. MOVEMENTS AND MIGRATIONS OF PEOPLES

Density as the Result of Retreat. In the ups and downs of human affairs too much stress cannot be laid upon disturbance due to clashes, to repeated invasions, or to a chronic state of war. Certain regions, the zone of steppes in particular, reaching from Mongolia to Turkestan, or from Arabia to the Maghreb, are more exposed to such devastation than others. History describes an endless series of invasions, from those related by Herodotus to those finally involving the Russians, and from those of Arabs to those of Almoravides and Hilalians. The advance of the Masai in East Africa, and of the Kafir in South Africa had far-reaching consequences, and left part of that continent strewn with fragments of tribes. North America has not escaped similar disturbances. During the eighteenth century did not an obscure tribe at the foot of the Rocky Mountains, the Blackfeet, suddenly sweep across the western prairies when they came into possession of the horse? In Europe even outside such open spaces, predestined

[21] P. Vidal de la Blache, *Tableau de la géographie de la France* (*Histoire de France*, Ernest Lavisse, Vol. I, Paris, 1903, pp. 55–57). This plate is placed at the end of the 1908 edition: *La France, Tableau géographique.*

to be the arena of migrations on a vast scale, lack of security long prevented the inhabitants from taking advantage of the natural highways which seemed made expressly for man's convenience. For hundreds of years the plateaus of Podolia and Galicia, so thickly settled today,[22] were a thoroughfare for tribes which periodically poured forth from the steppes along the black-earth belt like swarms of locusts. The châteaux or ancient fortified towns overlooking the valleys of the Rhine and the Rhône were refuges for the peoples of the plains from the right of the sword (*Faustrecht*). The French explorer, Crevaux, informed us only recently that in Amazonia, in order to escape the havoc wrought by the mighty stream, native tribes are in the habit of deserting its banks for less accessible valleys.[23]

Such facts have influenced the distribution of population, the effects often outlasting the causes which produced them. The result has been to drive whole populations back into protected areas which have had an abnormal growth in consequence. The mountains of the Great Kabylia, the oasis of Msab, possibly those of Tuat and Tafilet, owe their excess population to historic accidents of this sort. The articulated peninsulas of Greece, and especially the neighbouring islands, were congested as a result of

[22] Podolia has more than eighty inhabitants per square kilometre; Galicia, more than ninety.

[23] J. Crevaux, *Exploration des fleuves Yary, Parou, Iça et Yapura.* (*Bull. Soc. Géog.*, 7th series, III, 1882, p. 696.)

Turkish conquests. Again, the forced retreat of the populations from the open plateaus in the centre of the Balkan peninsula [24] where they developed, back into the heart of the long abandoned forested region south of the Save, in Shumadia, was a direct result of the Ottoman invasion.

The history of Algeria, of the Ukraine and of Ciscaucasia demonstrate how slow has sometimes been the reclaiming of such regions, worthy of a better fate though they were, after periods of invasion and insecurity. The open plains surrendered part of their population to the mountains, where it often remained. Other examples may be added to those already given,—the Caucasus, for instance, a fortress of peoples whose diversity amazed the ancients; the Alps of Transylvania, where the Roumanian nation was formed anew, and the Balkans, where the Bulgar people was reborn under Turkish rule. These mountain areas owe to such retreats a density of population which they never would have had by nature or because of any resources of their own.

Density as the Result of Concentration. Such is not, however, the normal course of events, at least in so far as we know. Men began to seek out certain localities, chosen because they were easy to cultivate, where, little by little, accumulated wealth became an object of envy. There they became established,

[24] J. Cvijić, *La péninsule balkanique, géographie humaine,* Paris, 1918.

built up their institutions, and concentrated their efforts, while the surrounding country was neglected or uninhabited altogether. Although limited in area and surrounded by barriers beyond their power to widen, these primitive populations were able notwithstanding to reach a rather high degree of density. Examples from very different regions enable one to get an idea of this sporadic method of intensive occupation; and one of the most curious results of recent investigations in the interior of Africa is the chance to observe this phenomenon actually in the making.

At present the chief obstacle to expansion of agricultural settlements in the Sudan, — an obstacle which they have not been able to surmount, — is, as we have shown, their inadequate tools and lack of agricultural knowledge. Formerly, in Europe, forests and swamps were hostile forces against which it was difficult and seemed even hopeless to contend. Groups were confined by them within limited areas. In order to break through such barriers, a combination of circumstances and constant effort were required, a progress of which only snatches can be seen, but which tells the history of the conquest of the soil.

In Europe, systematic collaboration in collective enterprise, the invention of better implements, the introduction of plants which will grow on poor soils, and above all, the substitution of scientific method for empirical method, — such things have almost brought about that mutual interdependence of dif-

ferent types of exploitation which makes of a region a single unit with common purposes and common interests. But, on the other hand, in other great civilised countries such as China and Japan, crops are confined to plains or to lower terraces, while mountains are not used even for grazing. Even in Japan the amount of cultivated land is only 15 per cent of the total area.[25] All the above facts, past and present, enable one to recognise over-population as an early consequence of the instinct or the necessity which led men to foregather, to settle in certain places, in order to be able to continue in their accustomed ways of life.

Overpopulation and Emigration. Under such circumstances over-population can be relieved only by emigration. China, — which is undoubtedly the one country today with an ancient civilisation whose primitive peculiarities have persisted longest, — has been the scene of many obscure migrations of which no record has been kept, but which taken all together, have resulted in changing the face of the earth. Travellers who have been in the interior have often seen the following spectacle: they meet on their way entire families moving from one locality to another, having been forced to abandon their homes, because

[25] *L'Agriculture au Japon* (*Exposition Universelle de Paris* 1900, Paris, Maurice de Brunoff), p. 20. See also the pamphlet published for the same exposition by the Forestry Department of the Ministry of Agriculture and Commerce of the Japanese Empire: *Description des zones forestières du Japon*, Dr. S. Honda.

of fire, an epidemic, or merely hard times. One traveller describes "these comely farmer families camping by the roadside, carrying with them food for the journey."[26] It is thus a question not of a vagrant proletariat, but of coherent groups of which women, children and old men form a part, searching for a favourable place in which to set up their household gods and continue to live in traditional ways. The most stable element in Chinese society is the family, and when transplanted in its entirety and given opportunity to grow again elsewhere, it will succeed, thanks to its cohesive power. Is not this in miniature a picture of the mechanism of the colonisation process? Humanity increases in numbers by swarming, after the manner of bees, rather than by adhering in clumps like corals. Surplus population does not attempt to occupy vacant spaces in the immediate vicinity. How would such individuals contrive to get along there, if unable to live in customary ways, and with customary means? They must necessarily cover great distances in order to find an environment similar to the one which they have been obliged to leave.

This process, which the Chinese have been able to elaborate into a method of systematic colonisation, is the one which has directed their movements among the various compartments of their immense domain. A map showing successive stages in the growth of

[26] *Die wissenschaftlichen Ergebnisse der Reise des Grafen* Béla Széchenyi *in Ostasien*, 1877–1880, I, Wien, 1893, p. 223.

China, such, for example, as that sketched by Richthofen in his great work, shows a series of advancing outpost settlements, rather than a progressive enlargement, such as would be shown upon a historical map of France. Isolated basins were acquired one after another by the superior civilisation founded by the sons of Han. If the equilibrium should happen to be upset, it is automatically reëstablished between basins, as between communicating vessels. In the seventeenth century, when Szechwan, — the rich "Country of Four Rivers," — had been devastated by Tibetan invasions, groups of immigrants flowed in to fill the vacancies. They were so careful to bring with them their household gods and domestic traditions that their descendants can today distinguish from just which province their ancestors came.

In 1861 when the British, penetrating farther and farther into the depths of their Indian Empire, undertook to organise the Central Provinces, they discovered, not without astonishment, how recent was the agricultural occupation of those districts.[27] It dates back to progress made, toward the end of the sixteenth century, by Mongolians under the Emperor Akbar in the valleys of the Narbada and the Tapti. These countries had remained a hunting-ground for

[27] Capt. James Forsyth, *The Highlands of Central India*, London, 1871. Compare P. Vidal de la Blache, *Le peuple de l'Inde, d'après la série des recensements* (*Annales de Géographie*, XV, 1906, p. 368).

the Gond. But the soil is composed of black layers of *regur*, known as "cotton soil," which had long been cultivated in the Gujarat and around the Gulf of Cambay. Part of the dense population on the west coast departed in groups and little by little established the practise of agriculture in the above-mentioned regions, which promised great things. The process of infiltration is still going on, and is gradually spreading. It is said to be gaining the favour of the clan chieftains who are anxious to raise themselves in their own estimation by a superficial veneer of Hinduism.

When the hive is too full, a swarm leaves it. Such is the history of all time. It is not mere chance that the books containing the oldest memories of the human race, the Venidad-Sadé, the Bible, Chinese documents and Mexican chronicles, are full of accounts of migrations. There is no people without a legend of a state of unrest, of *Trieb*, to use Karl Ritter's expression, which compelled them to move from place to place until they found a final resting-place constantly promised by the divine voice, constantly held at a distance by enchantment. Well defined areas comparable in size to those with which they had been familiar are the goal pursued from one stop to the next, — for Hebrews the land of Canaan, for Iranians the gardens of Soughd (Sogdiana), Mourv (Merv), Bakhdi (Bactriana), successively. No less fraught with difficulties was the odyssey of the Nahuatlacas, toward "the country of

rushes and gladioli," the shores of the lake where Tenochtitlan, the City of Mexico, was founded.[28]

The early Italians performed similar amputations on their over-crowded populations in the Apennines, detaching the flower of youth (*ver sacrum*) and sending it forth to seek its fortune. The early history of Celtic and Germanic Europe consists of a series of migrations, against which Roman and later Carolingian power often struggled in vain. The Helvetii, attracted by the fame of the plains of Saintonge and the Suevi, trying to dislodge the Sequani from what Caesar considered the best part of their domain, are examples of settlers in need of space, looking for land, because they did not know how to make the best use of their own. The Russian peasants of the black-earth belt would have rushed headlong into Siberia had the Russian government not built a dyke to prevent too rapid an inundation.

The Evolution of Colonisation. Humanity has not taken permanent possession of the earth's surface like a sheet of oil, spreading slowly and evenly in all directions. Some regions have remained unoccupied for long periods of time. To a certain extent they still continue to separate the occupied areas from one another. The latter are obeying a law of

[28] D. Charnay, *Manuscrit Ramirez, Histoire de l'origine des Indiens qui habitent la Nouvelle-Espagne, selon leurs traditions* (*Recueil de voyages . . . publiés sous la direction de Ch. Schefer et Henri Cordier*, XIX, Paris, E. Leroux, 1903), p. 13 *et seq.*, p. 25 *et seq.*

necessity in remaining detached, holding aloof from one another.

Small centres of dense population appeared very early, irregularly scattered here and there, — foci of crystallisation. By pooling their resources and experience, they became the humble workshops of civilisation. Some of these groups, under favourable conditions, were able to serve as laboratories for the formation of races destined later to expand and to play a part in the world.

But it has happened that in certain remote countries isolation has become a systematic policy. Those enjoying the benefits of the soil have tried to maintain their isolation by artificial means, for the frontier notion is as deeply rooted as that of war. This is why the jungle savages of Africa lay snares at approaches to their villages, why mountain tribes such as Circassians (Cherkess), Kurds and Kafirs, intrench themselves in the least accessible places; why even Tibetans have relegated their national holy of holies to the most distant valley.

Today such strongholds of isolation are exceptional. The destinies of nations would have been paralyzed if such primitive conditions had prevailed. On account of their isolation these societies were threatened with atrophy, with remaining permanently at the mercy of habits formed at a time when a new environment had first revealed to them the secret of better ways of living. Such human communities would in the end have resembled those of

animals which have become slaves of their organisation, over and over again repeating the same activities, living on progress made long ago once and for all.

But a leaven working within these primitive societies forced them to grow and to overflow beyond bounds. Their offspring consequently found themselves in the great world facing conditions whose novelty might overwhelm some, but which gave to the more highly gifted new sources of energy and possibilities of growth. Renan well described the transformation which took place among the Beni-Israel when they entered the land of Canaan.[29] The story has often been repeated since that time. In the vast majority of countries a wholesome process of thinning out has greatly enriched human relationships.

[29] E. Renan, *Histoire du peuple d'Israël*, Vol. I, Paris, 1887.

CHAPTER III

GREAT AGGLOMERATIONS: AFRICA AND ASIA

Since earliest times humanity has prospered in certain localities. "Increase and multiply" is one of the most ancient commands ever given to mankind. The notion of multitudes "as the sand of the sea which cannot be measured nor numbered" (Hosea I), early haunted the imagination. Here and there population was fairly dense because of purely local conditions. The discovery of implements of the stone-age has furnished interesting evidence as to where such prehistoric centres were located. But most early attempts at concentration were short-lived, because of the difficulties encountered when large numbers tried to live together within a limited space.

Some of these earliest societies yielded to centrifugal force and were detached from their nuclei like satellites from a planet. But in time others came together, and, if the comparison may be continued, condensed into nebulae. These agglomerations were formed independently, and far from one another. Their destinies were different, some continuing to expand, while others, — though such were excep-

tional, — dwindled or became mere shadows of themselves. Such agglomerations had been the result of a slow, gradual process of growth, for, in the remote ages when Egypt and Chaldea first appear in history, they already had traditions instinct with the glamour of high antiquity. The Greeks had marvelled at the great populations of the Nile and the Euphrates. They were equally amazed when Alexander introduced them to the Punjab and the valley of the Ganges. A later discovery, China, with its vast multitudes, astounded the contemporaries of Marco Polo. In addition to these ancient societies others developed as time went on. But so many and so complex are the factors involved, that geographical causes, though always active, are less directly apparent than in the early examples, — centres from which the human race began to spread over the face of the earth.

Distribution of these early centres seems to be confined, approximately, to a zone bounded by the Tropic of Cancer and the fortieth parallel of latitude. The climate is warm enough so that many plants can quickly complete their cycle of growth and take advantage of the interval between periods of seasonal rainfall or river floods. Fresh water in the form of springs, lakes and underground water or streams, collaborates with tropical or sub-tropical climates. The great rivers in particular, descending from the high Asiatic massifs, and fed by seasonal rainfall, not only bring waters impregnated with

soluble substances, they also deposit much alluvial material. One is almost tempted to guess that in the beginning the largest human settlements must have been located in the section of the lower valley where the over-burdened stream succeeded in depositing its load. As a matter of fact, are not some of the highest population-densities on earth found today upon some of the large deltas between the Nile and the Yangtze? Lower Egypt and Bengal are at present the most populous parts of Egypt and India. At the mouth of the Yangtze, population-density on the island of Tsungming and the peninsula Haimen reaches an exaggerated figure, the one of 1475, the other of 700 inhabitants per square kilometre.[1] Yet this gives a false impression. In reality, man did not set foot until comparatively late, and after long experience, in such amphibious regions. Low marshes without gradient, constantly menaced by floods, have been reclaimed for human occupancy only after tremendous effort. Indeed, all have not yet been made habitable; because not far from the over-populated deltas, others, even on the littoral fringe of monsoonal Asia, are still awaiting the multitudes which they are capable of supporting.

The truth of the matter is that these great rivers

[1] P.-H. Havret, *Note sur le bas Yang-tsé-kiang* (*Annales de Géographie*, III, 1893–1894, pp. 102–104, 1 fig. map). In the delta of Tonkin, density is always at least 200–300 per sq. kil., attaining even 500–600 in the Lower Delta. (E. Chassigneux, *L'irrigation dans le delta du Tonkin*, *Rev. de Géog. Annuelle*, VI, fasc. I, 1912, p. 57.)

have many different potentialities, depending on differences of régime, grade, chemical composition and origin of load. Instinctively man has been drawn to their banks by the abundant animal and vegetable life, like that shown in paintings of the ancient Pharaonic ages. Whether such wealth and plenty is confined to the banks of the stream, or whether it is spread over the adjoining country, it is in either case eagerly sought by all living creatures. But long-continued and coöperative effort has been necessary so to control and regulate the great mass of water as to attract the multitude, and this actually has been accomplished in but few places.

I. EGYPT

In the dawn of history multitudes of human beings gathered along the Nile upon the friable alluvial land, rich in chemical substances. These substances had been brought by the great stream, — tamed in a succession of quiet reaches, — from the volcanoes of Abyssinia and laid down in the long valley below Assuan. The strip of black earth (*kémi*), like a long snake, lies among the tawny sands. Prehistoric finds give evidence that the population early reached a very high density.[2] The fellah population which has always been the mainstay of Egyptian civilisation and which comprises today 62 per cent of the total population, is one of the

[2] J. de Morgan, *Recherches sur les origines de l'Egypte. II. Ethnographie préhistorique* . . . , Paris, 1897, p. 67.

original human types firmly planted within its own domain, inherently prolific and strangely true to type throughout the ages. This population began by spreading out across the rich acres, revelling in the luxuriance of vegetation,[3] while gradually little groups of agriculturists, called *nooit* or *nome*, comparable to the present *nahieh*, began to take root here and there. Such a type of occupation has no resemblance to the concentrated, cautious life of the desert. Egypt is sometimes very incorrectly likened to a long oasis, the latter a name invented by the Egyptians for the express purpose of differentiating such places from their own domain. The fellah moves about with ease, and in case of need, makes short work of carrying his rudimentary abode from one part to another of the alluvial band which is his only real home.[4]

The nature of the soil necessitates coöperation. Moreover, its nature is such that stagnant water soon becomes brackish. And so it was no less imperative to make sure that the flood-waters should run off

[3] "The Egyptians began by eating indiscriminately all the fruits which the country produces." (G. Maspero, *Histoire ancienne des peuples de l'Orient classique*, I, Paris, 1895, p. 64.)

[4] "The little villages, hamlets and farms, for the most part as easily built as destroyed, sometimes change position; in such an event the population removes to a nearby advantageous location and the former dwellings are abandoned. This fact explains the considerable number of unoccupied sites of which the census had to take account." (Ministère de l'Intérieur, *Recensement général de l'Egypte*, 3 mai 1882, Rapport, 5e section, Le Caire, 1884, p. XII.)

quickly, after having deposited their load, than to capture them in passing. Temptation to divert the water permanently was counteracted by the necessity of releasing it as soon as it had been utilized. This explains the series of basins built in steps parallel to the Nile and emptying into one another, — a sort of arrangement moulded to fit the river's needs. It had the effect of doubling the flood-area, consequently the area of occupation.

Increased density did not prevent a growing demand for labour. Under the Pharaohs this demand can be seen at work upon the neighbouring populations of Palestine and Syria, especially upon the Nubian peoples whose never-ending flow toward Egypt seems like the operation of a natural law.[5] This influx has, nevertheless, not perceptibly altered the basic native element, — proof of the persistent fecundity with which it has met all vicissitudes. But the region occupied is too small and the conditions of adaptation too artificial for the density of population to have been constant since classic antiquity. Here, as elsewhere, the consequences of Arabian and Turkish conquest have had the effect of perceptibly reducing human capital. At the time of the French expedition into Egypt, the population was estimated at only 2,460,200; twenty-three years later, Mohamet-Ali estimated it at 2,536,400. Half a century

[5] "The districts south of Assuan comprise the region commonly known as Nubia, which is the native land of the Berberine." (*Ibid.*, p. XXVII.)

later a census was taken, the beginning of a series whose accuracy admits of less and less question. They all show a progress as rapid as it is enormous;

1846	4,476,440
1882	6,831,131
1897	9,734,405
1907	11,287,359
1917	12,566,000

Thus the indigenous agricultural and sedentary race, — because the number of foreigners or of Bedouin nomads is negligible in comparison, — has given proof of an amazing elasticity during the last three-quarters of a century. The first fact worthy of note is that this growth keeps pace with a notable increase in the cultivable area, the system of irrigation throughout the year by means of canals direct from the great dams and hoists having become general, particularly in the Fayum and Lower Egypt. The cultivable area estimated at a little over 23,000 square kilometres twenty-five years ago, today exceeds 31,000. Furthermore, industrial crops, especially cotton, demand a larger supply of labour. In the localities reached by such methods of irrigation, winter, summer and autumn harvests follow one another without intermission. This explains the rapid jump made by the population of this old Egyptian land in less than half a century, — not a unique, but a particularly striking example of the fact of how quickly any economic progress has its effect upon population.

II. CHALDEA

Egypt has continued to be a focus of population, while other centres have perished and, like Chaldea, are awaiting a hypothetical resurrection. Not that natural resources were lacking at the outset. Here again it was soil (*al sawod*), dark in colour, but yellower and more calcareous than that of the Nile, soil brought by the Tigris and Euphrates, which was the nucleus of the development of primitive Chaldea.[6] The Euphrates, whose spring floods are loaded with this alluvium, goes through a first process of decanting in the great marshes which ancient Babylon, for a time, succeeded in making hygienic. While awaiting the completion of vast irrigation-works which the Babylonian monarchy was to build, draining the marshes enabled the earliest inhabitants to assemble in groups, — little kingdoms, as it were, — and to build the cities, long since dead, whose names echo and re-echo in earliest Bible legends.

But it is doubtful, even so, whether the resources of the region ever could have supported a population as dense as that of Egypt at that time. Seasons of flood were less regular, their control more uncertain and more dangerous. The Babylonian dynasties seemed particularly concerned about increasing the labour-supply required for building great public

[6] Sir William Willcocks, *Mesopotamia: Past, Present, and Future.* (*Geog. Journ.* XXXV, 1910, pp. 1–18, 4 phot. pl. and map.)

works and maintaining the urban population. This they accomplished by transplanting entire populations. Voluntarily or otherwise, foreigners flocked thither. The people have a cosmopolitan appearance which strikes observers and which the Greeks often remarked upon.[7]

During the lapse of many centuries the continuity of development has been broken. Near Bassorah, remnants of the forests of palms along the Euphrates, which the Romans admired in the fourth century of our era, can still be seen.[8] But peoples and civilisations are turned to dust. The native population which is the resistant core of Egypt no longer exists here. Where could it be found among the heterogeneous multitudes of Bedouin nomads and farmers, — roughly estimated at a million, — listlessly cultivating a few damp bottom-lands? To reconstruct the ancient populations of Elam, Chaldea and Ashir which once flourished on the banks of the Karun, the Euphrates and the Tigris, would probably not be beyond the power of a great modern state. But it would be a long pull. And even if the age-long task accomplished by ancient Chaldea, — a splendour which the last six centuries of anarchy have succeeded in obliterating, — were undertaken once again, and if one tried to bring back to life all the Chaldean

[7] **Πολὺ πλῆθος ἀνθρώπων ἀλλοεθνῶν**, said Berotius in the third century B.C. — *Πάμμικτον ὄχλον*, Aeschylus had said before him.

[8] Ammianus Marcellinus, *Roman History* (Book XXIV, Chap. III, 3, 12), member of the expedition of Julian, vividly describes these forests of palms, "*instar ingentium nemorum.*"

territory, this area at the utmost, as has been shown, would not exceed 20,000 to 25,000 square kilometres.[9] A valuable conquest without doubt, but one for which the most optimistic forecasts of population fall far short of the vast multitudes in India, China, or Europe.

Located within the arid zone which crosses western Asia, separated as they are from one another by great reaches of desert, these foci of concentration, like those of Fergana and Samarkand beside the snowy massifs of central Asia, are mere specks upon an almost vacant background.[10] Egypt alone, because of its location between Africa and Asia, the Mediterranean and the Red Sea, is a cross-roads for mankind. It is a sample in miniature of one of those persistent groups which, for long periods of time, fix the pivot of human relations at certain definite points.

III. CENTRAL ASIA

A conception of great agglomerations which occupy extensive tracts of territory can never be gained

[9] See evidence given by Hermann Wagner, *Die Ueberschätzung der Anbaufläche Babyloniens. . . .* (*Nachrichten K. Ges. Wiss. Göttingen, Phil.-hist. Klasse*, 1902, Heft 2, pp. 224–297, 1 pl.)

[10] In the farming districts of Fergana, density would barely exceed 30 inhabitants per square kilometre. But, according to A. Woeïkof, "Fergana is a land of contrasts. Some oases are so densely populated that one has hardly passed the loess garden-walls of one large village when the gardens of the next come into view." (*Le Turkestan russe*, Paris, 1914, p. 139.)

by considering them singly, nor from the point of view of their own advantages merely. The latter may have no value whatever if they are not vitalized by additional intelligence and energy from without. It is an interregional affair. And so the means of communication between the continent as a whole and localities where human alluvium has accumulated, have to be taken into account. One of the notions dear to Karl Ritter was that certain countries have had an educative influence upon peoples. This is true only in so far as routes by which colonists arrived in such places are known; in other words, what had been their process of initiation. Large tracts of territory capable of opening wide, unbroken vistas to their inhabitants, is a fact of primary importance in this connexion. Such continuity gives opportunity for contact without necessarily giving rise to a clash of interests.

Observe the outer slopes of the high, folded chains crossing the continent of Asia. They are bordered by a fringe of varying width, — regions, some of which became famous at the dawn of history, such as Osroene, Assyria and Elam along the chains of Armenia and Iran. Surrounding the knot where the chains of central Asia meet, are Bactriana and Sogdiana, on the one hand, and Serica on the other; while south of the Himalayas is the "Country of the Five Rivers," ancient Pantschanada, today the Punjab. Primarily arable lands, yet thoroughfares of commerce as well, they have always been the scene of

great human activity. Historic routes by which China communicated with central Asia followed the great chains of Tian Shan and Kwen-lung, one north, the other south of the valley of the Tarim. While it is true that within the folded chains themselves and in the interior of the intermontane basins, free circulation is increasingly difficult, yet upon the outer slopes the direction of traffic is plainly indicated by terraces skirting the foot of the mountains.

The points where streams escape from the mountain defiles have always been favourite sites for human settlements. Water is more easily controlled there than elsewhere; thanks to alluvial fans a supply may be had from every direction, and the slope is sufficient so that the network of ditches can spread far and wide. The Spaniards of Mexico, accustomed to similar elementary practises of irrigation, call the outlet through which a stream issues from the Cordillera *boca del agua;* and even before their time, the Pueblo Indians knew how to take advantage of such places. Furthermore, if melting snow and glaciers are abundant, ground water wells up in the lower valley, where, underneath the sands beyond the accumulations of boulders and gravels which were first laid down by the stream, water percolates through, only to reappear in springs (*fontanili*) or to be readily accessible to wells. In any event, for agricultural purposes these waters need only the simplest sort of regulation and control, which is not beyond the powers of natives who, — to quote one of those

best acquainted with central Asia, — "understand very well how to make use of the smallest rivulets, . . . but are incapable of building important irrigation-works." [11]

The land is no less favourable than the water-supply. It is composed of transported soils, which, in these dry sub-tropical regions, retain the substances with which they have been impregnated by the action of winds or running water. Since it is not exhausted by tropical rainfall, this soil has in reserve quantities of soluble residuals such as chalk, potassium and magnesium, — inherent fertility awaiting cultivation. Each year the same miracle is repeated, — a sudden bursting forth of plant-life, a wonderful efflorescence, lands which previously seemed lifeless blossoming at the first contact with spring rains. And these multitudes of annual plants fulfil their promise of seed within a few months' time! This lesson was not lost on mankind. No discovery unless possibly that of fire, has left a deeper impression. Not to mention the myths which it engendered, it taught the inhabitants to scan the skies, anticipating rain, and to plan their crops accordingly. Alongside the irrigated oases, crops were raised on non-irrigated land. In the Punjab the plateaus between the irrigated valleys (*khadar*) are called *bangar*, apparently the same word as *bagara*, by which the Iranian agri-

[11] Commission Impériale de Russie à l'Exposition Universelle de 1900, *La Russie Extra-Européenne et Polaire . . .*, by P. de Semenov, Paris, 1900, p. 143.

culturists of central Asia [12] designate the lands sown in anticipation of winter and spring rains, lands usually adjoining irrigated oases. Thus the two chief types of agriculture interlock. Wheat, barley and millet grow on both irrigated and unirrigated soil. The rigid boundary which holds the cultivator of the Ksoor as in a vice does not exist between oasis and desert, between dark loam and tawny sand. Varied conditions, capable of extension and improvement, are offered to man, — slopes of loess occasionally drenched by rain, streams swollen by melting snow, and infiltration from snow and glaciers high above. If within the long strips of territory following the trend of the topography cultivation is interrupted, it is only to reappear further on in much the same form. The plough is used and the same cereals planted throughout the entire distance.

In Asia, for more than two thousand years, invading hordes of nomads have devastated the agricultural areas and driven back into the mountains the people who had fertilised their slopes, and to whom we owe a large proportion of our cultivated plants. But the tenacious farmer has never let go. An Iranian proverb says, "Wherever there is water and good soil the Sart is found." [13] The Persian peasant, while the storm is raging, squats behind the

[12] P. de Semenov, *op. cit.*

[13] To which should be added as no less characteristic, — "If a Sart becomes rich he builds a house." (A. Woeïkof, *op. cit.*, p. 130.)

mud walls of his town. On the plateaus of Karmelis and Erbil busy villages press close about the innumerable tumuli, remains of ancient Assyrian settlements. Such is the force of certain natural phenomena that they produce everywhere the same results. Indian migrations toward Mexico took place along the eastern slopes of the Rocky Mountains. The Incas of Peru advanced their civilisation toward the south, as far as Chile,[14] skirting the foot of the Andes from one oasis to the next. But there was in America no China and no valley of the Ganges at the journey's end.

IV. CHINA

The swarming multitudes on the boundless alluvial plains of the Hwang-ho (Yellow River) and of the Yangtze, the Chinese people, whose very name brings up a picture of unparalleled fertility, believe that they originally came from the west. Moreover, their bonds with central Asia, from which they obtained horses and jade, and where their silk markets were long held, have never been broken. The northern periphery of the central Asiatic massif had as its natural outlet toward the east, the area of discharge where rejuvenated erosion carries interior drainage toward the sea. The interior basins, lacustrine in origin, thereby have undergone a transformation. Freshened by the constant inflow of running

[14] See Isaiah Bowman, *The Regional Population Groups of Atacama* (*Scottish Geog. Mag.*, Vol. XXVI, 1910, pp. 1–9, 57–67, 1 map).

water, renewed by constant sedimentation, they gradually built up a continuous series connected with one another, — though the connexion is as yet incomplete, for the Hwang-ho and its tributaries still flow through a series of gorges and basins. Nevertheless, the continuity is sufficient to bring about closer relations between groups, and freer mutual interchange. Ease of communication was all-important for this agricultural people. A sudden increase in population resulted each time that a group, which already had reached a certain stage of civilisation, though still relatively crude and poor, acquired more freedom and an opportunity to exercise in an ampler environment the very qualities to which their progress had been due. The Beni-Israel soon began to multiply after leaving the steppes of Aram for the more fertile lands of Canaan. Hellenism took on a new lease of life in Asia Minor and Sicily, compared to which continental Greece seemed to be "own brother to poverty."[15] Similarily the Germans, once out of their northern barrens, began to expand on the banks of the Rhine. Such was the experience of certain Chinese tribes when, at a time difficult to determine, they descended from the eastern oases of the interior of China and settled in the valley of the Wei-ho, the great tributary of the Yellow River.

The historic provinces of China, Kansu and Shensi, indicate the route followed. They are closely related by nature. In the first the desert still domi-

[15] Πενίη σύντροφος (Herodotus, VII, 102).

nates. It is all-pervasive. The cities scattered intermittently between Soochow and the Yellow River all have an oasis-character. But in Shensi the entire area could be cultivated. The practise of agriculture became more general but was altered in the process. The oasis-farmer brought to these plains of loess agricultural arts which were novel here, but with which he was already familiar,—irrigation of the fields by mountain-streams. But on the other hand, confronted by new problems, he learned to amplify his own methods in order to make use of larger sources of supply.

These are still somewhat similar to methods of cultivation native to the hill-slopes of central Asia, however. For both show the same skill in distributing streams, wherever the grade is sufficient, by means of an artificial network of canals, and in combining plateau crops with valley crops. This agricultural civilisation, before spreading out over the vast deltaic plains, seems loath to leave the mountains; it follows the foot-hills, loyally clinging to them in Chihli and Shantung. Or else it appears satisfied with basins of limited dimensions. The basin of Taiyuan-fu, in Shansi, for instance, one of the cradles of Chinese civilisation, has an area of only 5,000 square kilometres, and that of Sianfu, on the Wei-ho, one of the most ancient population-centres, has barely twice that area. But thanks to a more favourable type of rainfall, though in these northern provinces still somewhat uncertain, the yellow earth

has a chance to prove its great fertility. It becomes the talisman on which the very existence of the people depends.

In China the conquest of space did not proceed with great strides as it has in our own day in the United States, but step by step, little by little, in accordance with the gift for detail and the native habits of the race. A slow advance can be detected in the direction toward which mountains gradually separate, horizons widen, and watercourses flow. The immigrants from west and north find in Honan, midway between the two parts of China, Cathay and Manzi, a more generous rainfall in a province where the yellow earth scatters into fine deposits. Beyond the transverse chain separating the valleys of Hwang and Yangtze, although outside the loess district, the hot sunlight, drenched with monsoon-rain, produces a larger variety of crops. In these new surroundings, knowledge already gained was not useless; the setting had been made; it was necessary only to enlarge it. In fact, a greater collective consciousness characterises this group of provinces, — Shensi, Honan, Shantung, — where greater opportunities offered. Here was the seat of the first dynasties, the site of the most ancient capitals,[16] the fatherland of sages and philosophers. The intermediate region,

[16] Sianfu (Shensi), Lo-yang (Honan), — the latter about the third century B.C., when the first canals between two great river-systems were begun.

where differences between north and south blend, the province of Honan, south of the Hwang, is called in Chinese idiom *Flower of the Centre.* The population which in the north is grouped in villages, here is scattered in countless little hamlets, indication of an expansion and of a confidence which is sometimes misplaced, inasmuch as famine is a constant menace on account of the uncertainty of the seasons.

But in the region where alluvial deposits of the two great rivers mingle, the struggle with nature is more intense. It used to be only a labyrinth of marshes and standing water, among which rivers subject to high flood meandered about. Access to them is still so difficult that in 1856 the march of the Taipings toward the north was stopped there. From time to time the "monster leaves his cage"; the Hwang, swinging suddenly out of its course, covers the countryside with a muddy flood.[17] Struggle against such an enemy means coöperation. For such regions there is but one alternative, savagery or overpopulation.

Religion and the state both knew how to deal with the situation. The era of great coöperative undertakings began in China in 486 B.C., with the excavation of the first section of the Grand Canal, approximately four or five centuries before the beginning of such an era in Japan.[18] That was the time

[17] In 1850 the Hwang-ho, abandoning its former mouth, made for itself another four degrees farther north.

[18] Father Gandar, *Le Canal Impérial* . . . (*Variétés sinolo-*

when a comprehensive plan took the place of private and local enterprise. The question of population, which in this race of small farmers was already a family responsibility, became henceforth an affair of the state. In China, as in India, economic necessity which was transmuted into religious precepts, gave rise to ancestor worship. In the Chinese code as in the Brahman doctrine, marriage and the procreation of numerous progeny are a sacred duty which assures ancestors of the performance of domestic rites. In China there is a further political interest. The emperor, head of the nation-family, ordered censuses taken, it is said, centuries before Christ. There were premiums for children, and penalties for celibacy. If sometimes the increase did not seem large enough, imaginary statistics obligingly swelled the totals. But they were soon reached in reality. The word "terrifying" is used by European writers for the number of children in Chinese families.[19] Wherever the Chinese congregate either for work in rice-fields, for hauling boats, in endless suburbs, or in swarms in city streets, one gets the impression that the human reservoir is running over.

The present total population of China proper is

giques, no. 4). Shanghai, 1903. Count Yanagisawa, *Histoire critique des travaux statistiques au Japon depuis l'Antiquité jusqu'à la Restauration impériale* (*Bull. Institut int. de Stat.*, XIX, part 3, La Haye [1912] pp. 245–307).

[19] For example: *Ferdinand von Richthofen's Tagebücher aus China.* Ausgewählt u. hrsg. v. E. Tiessen, Band I, Berlin, 1907, pp. 55, 564.

not known with accuracy; the figure has probably been exaggerated in recent estimates by too close a comparison with Europe.[20] The population is far from evenly distributed. Between the basins where it has increased at will, are frontiers as yet untouched. It has apparently concentrated its effort at the foot of the mountains, on the canalised plains and the interior basins where the practise of agriculture is traditional. The interior basin, called the province of the Four Rivers (Szechwan), where streams descending from some of the highest mountains on earth converge, is justly known as one of the irrigation marvels of Chinese agriculture;[21] in the central plain of Chengtu there is a density estimated at 300–350 inhabitants per square kilometre, but the population is almost entirely confined to that part of the province. If the total population of Szechwan were estimated at about 45,000,000, it should be borne in mind that at least two-thirds are in the central part.[22]

[20] The figure 302,110,000 (for the eighteen provinces), census of 1910, would seem to be approximately correct. (*The Statesman's Year-Book*, 1917, p. 763.)

[21] Archibald Little, *The Far East*, Oxford, 1905, Chap. VI, p. 78, *et seq*; CHAMBRE DE COMMERCE DE LYON, *La mission lyonnaise d'exploration commerciale en Chine*, 1895–1897, Lyon, 1898, Part I, Book II, p. 175, note 2: "In rugged places, . . . streams have been drained dry; the surface of the earth is transformed into a series of steps, and the water overflows from one step to the next."

[22] *La mission lyonnaise*, pp. 232, 256. Likewise in Shantung, Richthofen notes the extraordinarily uneven distribution of population. (*China*, Vol. II, Berlin, 1882, p. 256.)

All the rest, namely, the high mountain slopes, — places which on account of their altitude or their remoteness have escaped the cultivation necessitated by proximity to large centres, — have remained in the possession of previous inhabitants, continuing to practise a more or less primitive agriculture. Beyond the region of loess, in which the soil is capable of yielding rich harvests without the use of fertilizer, south of Honan, where the fertility of the rain-swept lands has to be built up constantly, a wider margin is left to the peoples who, under different names,[23] represent earlier strata, if not the original stratum, upon which the more advanced races have been deposited like recent alluvium. Historically this appears in the process of colonisation, multitudes advancing at first from west to east, later from north to south. They expanded as soon as they reached the wide interior basins which mark the junction of the Yangtze and its great tributaries. And when, as a result of systematic increase of its resources, and the encouragement given by its ancient dynasties, these peoples finally developed a technique and a

[23] Laï, in the mountains of eastern Shantung; Lolo, Miao, Mantzé, in Szechwan. The population living on the Canton river seems to be a remnant of primitive peoples. Regarding the aboriginal tribes between Fukien, Kiangsi and Chekiang, see *The Book of Ser Marco Polo* . . . translated . . . by Colonel Sir Henry Yule, 3d edition, revised . . . by Henri Cordier, II, London, 1903, p. 228, note 3. Throughout the whole of China there is an ethnic substratum upon which Chinese alluvium has been laid down.

labour-supply adequate to the great task of canal- and dam-construction, their domain was enlarged, and the prolific multitudes proceeded to multiply without limit. In the organic development of Chinese civilisation, however, these delta-plains are like an enormous excrescence grafted on the main trunk. The axis of China is not there. The Central Railway from Peking to Hankow indicates the direction followed by migrations better than the shore-line. When, finally, basins and alluvial plains gradually contract, making way for the mountainous, dissected areas toward the south, the wave of emigration divides and scatters.[24] But it continues to seep through valleys and river mouths. In a similar way the Malay people, constantly being modified and denatured by a continual process of cross-breeding, is penetrating Indo-China and Indonesia far into the interior. And these are but half-way points, whence, in spite of obstacles, it would be ready to sweep over the entire periphery of the Pacific.

[24] The rapidity with which the population bordering the Yangtze was reconstructed after the Taiping insurrection (1852–1864) which cost the lives of several million men, has often been commented upon. But such was not the case in the mountainous provinces of the South. Kweichow has not yet, after fifty years, filled the gaps following the great revolt, in spite of immigrants from Szechwan. (De Mecquenem, *Le Koueï-tchéou, Essai sur le commerce extérieur de la province*, *Bull. de Géog. hist. et descriptive*, XXIV, année 1909, pp. 384–395.)

V. INDIA

A study of the great areas of dense population hemmed in on the one hand by the Hindu-Kush and the mountains of Assam, on the other by the Himalayas and Cape Comorin, shows the striking similarity between human phenomena on a large scale.[25] Underneath the migrations which have deluged India as well as China with fresh floods of population, a geographical cause is at work, — change from an arid to a moist climate, from the realm of the oasis to that of monsoonal rains. It is an easy transition from the valleys watered by the Naryn, the Zarafshan and the Oxus to the Land of the Five Rivers, the Punjab, historic, — doubtless prehistoric, — vestibule of invasion and immigration.

Aryan tribes travelling along the mountains into the great Indo-Gangetic plain, like the Chinese tribes streaming out of Kansu and central Asia, were charmed by a more and more luxuriant vegetation toward the east. South of the sill of Sirhind, the monsoons become more pronounced and regular; the sandy soil of the Doab, or interstream area, between the Jumna and the Ganges, with shallow water-table, is tapped with innumerable wells. The

[25] *Le peuple de l'Inde, d'après la série des recensements* (*Annales de Géographie*, XV, 1906, pp. 353–375, 419–442, 8 figs.). According to the census of 1911, the population of India (British provinces and native states included, Burmah and Beluchistan not included) approximates 302,000,000 (about 280,000,000 in 1901).

growers of palm, fig and laurel won new recruits, rice, bananas and sugar-cane, in addition to crops of the oasis. As with China, an almost sacred character invests the region where the poor, hard-working peoples first began to enter into a fuller life. It is indeed remarkable that it is not Bengal, where nature is most prodigal, which stands out in the grateful memory of this people, but the upper valley of the Ganges, as far as the sacred city of Benares, which in Brahmanic Sanskrit literature is the blessed land, the Middle Country, *Madhia desa!* Downstream to that point the village-type which the Aryans brought with them, a traditional organisation whose well-ordered activities suggest the arid regions where it originated, is still preserved in its original form, or very nearly so.

But the farther one advances toward the regions where rainfall is abundant, either toward the east in Bengal, or south toward Cochin and Travancore, the more scattering and numerous are settlements; the closed village makes way for countless little hamlets, the boundaries between which are often difficult to distinguish. A similar change takes place in China. South of the provinces of Honan and Shantung the altered character is shown by characteristic dispersal. "Innumerable little farms, identical in appearance, dozens of mud houses with a few trees, all huddled together. Rarely does one see a larger village." [26]

[26] Richthofen, *Tagebücher*, I, p. 437. See also *Die wissenschaftlichen Ergebnisse der Reise des Grafen* Béla Széchenyi *in Ostasien* (1877–1880), I, Wien, 1893, p. 113.

Such is the appearance of the country watered by the Han, in the province of Hupeh. And in the plain of Chengtu (Province of Szechwan) the members of the Lyonese expedition were amazed at the great highway which, for about 80 kilometres, "was, so to speak, a single street bordered by houses."[27] The population expanded with greater freedom upon a soil promising richer returns; but the foundations of the social state differ only in appearance. The closed village was an expansion of the family; the hamlet is the very family itself, uniting all its forces in a small agricultural community.[28]

And so these agglomerations, whose magnitude astounds us, are composed of a multitude of little groups or living cells. The fabric is made up of innumerable fine threads, all interwoven, but which, for all their fineness, are none the less strong and tough. The settlements in North China are so arranged as to unite in groups families closely connected by a common descent and ritual. In the village-type of northern India, family ties between the inhabitants are so close that as a result of the

[27] Chambre de Commerce de Lyon, *La mission lyonnaise*, Part I, book II, Chap. I, p. 125.

[28] Such is the picture presented by the iconographic Chinese rituals in miniature, and which many travellers describe. Richthofen, for example, in his notes on the province of Chokiang says, "One of the prettiest family scenes imaginable is that of the grandfather, with his numerous progeny, supervising the picking and the various preparations of the tea leaves, an undertaking in which each one has his appointed part. The best tea-gardens are located here at a height of 500–800 metres." . . . (*Tagebücher*, II, p. 35.)

directions and restrictions governing marriage, alliances within the village are made almost impossible.[29] A wife is sought in a neighbouring village.

Yet, broadly speaking, all these groups bear a certain resemblance to one another. They have a common civilisation capable of gradual expansion, and it is endowed with remarkable vitality, in India no less than in China. Here is one of those impressive human creations, — the end-product of an ancient history. Peoples of various origins, gradually brought together in certain favoured spots, have been moulded into a unit. Constantly renewed effort and an ever-increasing patrimony have been required to bring this about. A consolidating power has been developed, capable of holding immense multitudes together in mutual dependence: not, however, that there is no room in the interstices for refractory groups still loyal to their primitive state.[30] Such was the case with those great monarchies of antiquity, Egypt and Persia, and this is why contemporary

[29] *Le peuple de l'Inde . . .* (*Annales de Géographie*, XV, 1906, p. 373). In addition to these ties there are in India those of the caste system. " It is harder for a Hindu than for any other man to leave his social group. Rules of caste are such that as soon as he does leave, his life becomes increasingly difficult at every step." The result is that more than nine-tenths of the inhabitants continue to live in the place of their birth.

[30] Between the great centres of population in India, those in the north and those in the south, live (near the source of the Narbada) the Baiga, dwarf huntsmen armed with poisoned arrows. The Bhil and Gond tribes, not far away, are not much more developed.

civilisations of India and China still have a touch of the archaic.

The more one studies the composition of these great agglomerations, the more one finds that they are the result of a prolonged process of sedimentation, in whose successive deposits the natural sequence of layers is plainly visible. The more advanced peoples, who were the last to descend upon these regions, have stamped them with the seal of their own social and political institutions, which, henceforth, will characterise and distinguish such places in the world at large. Their rôle was primarily to bring together the groups they found already established and by means of their own superior civilisation to weld them more closely together and to build a single structure out of the scattered fragments. They have been superposed upon earlier strata.

We can as yet only guess at the heterogeneous mixture of which the Chinese agglomeration consists. In Japan three or four fundamentally different types are distinguishable. As for India, researches carried on by the Ethnographic Survey for thirty years give an inkling of how many different elements enter into this aggregation of 300,000,000 men. To speak only of the Indo-Gangetic plain, how many varieties and what unfathomable diversities of race are concealed beneath such brief and provisional names as Indo-Ayran, Aryo-Dravidian, Mongolo-Dravidian! As soon as one begins to analyze ethnic characteristics, one suspects many other differences in

addition to those of language, and one begins to discover upon what foundations and of what varied materials these human edifices are built, — so well cemented together that they seem one and indivisible.

And yet their power of growth is not unlimited, any more than the mounting sap of inventiveness which vitalised them at the outset. The latter seems to have dried up and growth seems to be almost stationary. It cannot be compared, at any rate, either in China or in India, to the growth of population in Europe during the nineteenth century. According to an American minister, W. W. Rockhill,[31] — one well qualified to judge, — the population of China seems to have increased but little during the last century. There, as in India, the high birth-rate is counterbalanced by an almost equally high death-rate. If considered over short periods of time, the population sometimes may show a decided gain; but in order to get a fair idea of it there must be a certain perspective. It is the ancient story of the fat kine. For lean years follow, — a series of plagues, famines and epidemics defying even the British Administration, but subsiding in their turn, as if in accordance with a law of periodicity. And all the poor creatures weakened by want, lack of proper hygiene

[31] *The 1910 Census of the Population of China, T'oung Pao,* or Archives concerning the history, languages, geography and ethnology of eastern Asia, XIII, 1912, pp. 117–125. (See also: *Bul. Am. Geog. Soc.,* XLIV, 1912, pp. 668–673.)

and precarious living in general, disappear as if by magic.

VI. ASIATIC ARCHIPELAGOES. JAPAN

The continent of Asia, because of its vastness and far-flung relations, alone could provide such agglomerations with the space requisite for their needs. But within the shadow of this continent stretches an island-world, closely linked to it by the monsoons. An important fauna, including the earliest known specimens of the human race, had developed before Sumatra, Java and Borneo were separated from the continent of Asia.[32] As a result of the countless fragments of which these archipelagoes are composed, — islands which the astonished Marco Polo estimated at thousands, — there evolved what is known as the Malay race, a group rather than a race, sprung from the promiscuity and ferment of maritime life. The Malay is related to the Dravidians of the Deccan on the one hand and to Chinese and Koreans on the other.

In such an immense and widely distributed group the most heterogeneous elements and the most unequal stages of social development exist side by side. There is a marked contrast between coast and interior: an ancient tide of immigrants, — Tamils from India or Chinese from Fukien, — swept the shores

[32] The sensational discovery of Dr. Eugène Dubois on the left bank of the Bengavan River (Central Java), in 1891, is well known. — Borneo has a fauna remarkably rich in mammals (175 known species).

of neighbouring islands, constantly growing numbers of men and of races, while, in valleys and on mountain-slopes, half-civilised tribes like the Battak of Sumatra or the Dyak of Borneo[33] continued to vegetate, and real primitives succeeded in maintaining themselves in the depths of tropical forests. High density of population has been reached only in certain parts of this insular domain, — first, in Java, where Hindus early brought their rice-culture and the elements of a superior civilisation, putting the island by so doing in a position to profit by the security and the advantages of European administration;[34] second, in the Philippines, where the central valley and the deltaic region of southern Luzon have a rapidly increasing density.[35]

The three principal islands of the Japanese archipelago, Kiu-shiu, Sikok and Hondo, have today a population greater than that of the British Isles at the opposite extremity of the Old World.[36] In this

[33] The villages (*kampongs*) of the Battak are highly organised (houses of chieftains, rice granaries, blacksmith shops). The Dyak are also fairly well advanced. But the native population of the interior is either stationary or decreasing.

[34] Since the first quinquennial census (1875) the population of Java-Madura has increased from 18,000,000 to 36,000,000.

[35] The so-called "civilised" population of the Philippines doubled between 1845 and 1903. (F. Maurette, *Les Philippines d'après le recensement de 1903*, *Annales de Géographie*, XVI, 1907, p. 257.)

[36] Population of Japan (Kiu-shiu, Sikok, Hondo, Yezo), in 1915, 55,000,000, or almost 200 per square kilometre, not including Yezo.

archipelago, traces of man are very ancient, as well as throughout the entire southeastern periphery of Asia. The clearest idea which can be formed as to the inhabitants of primitive Japan, is that of a population whose early and relatively great density was due to abundant fishing-grounds off the coast. The importance of fish in Japanese diet is well known.[37] One-twentieth of the present population is engaged in fishing. It has been said that nowhere has the sea played a more important part in the material and moral development of a people. Certainly it explains the early high density along the Japanese coast.

The indented shore-line, bathed by ocean currents, is not unlike the coast of sounds and fiords, on the opposite side of the Pacific, between Puget Sound and Alaska. There, also, abundant fishing-grounds, where currents meet, early attracted a relatively dense population. But there were other reasons why Japan did not stop at the stage where tribes such as Nootka, Tlinkit, etc., of the American Northwest remained stationary. Contact with Asia was productive of other results than contact with pre-Columbian America. Proximity to a great, thickly populated, civilised continent became historically evident about the seventh century before Christ. The task of organisation, which gave its stamp to plastic Japanese society, began in the southernmost island, Kiu-shiu,

[37] See Hugh M. Smith, *The Fisheries of Japan* (*National Geog. Mag.*, Vol. XV, 1904, pp. 362–364).

the one nearest to Korea and China. From that as a centre it radiated and spread in all directions. It reached in turn the two great islands with which it is connected by the innumerable indentations of the Inland Sea. The island of Hondo was still occupied in the interior by the Ainu,[38] a people which has always been to the Japanese a symbol of savagery. While the Ainu were mercilessly driven back toward the north, the imperial dynasties made it their duty to receive and to distribute among their own subjects immigrants from China and Korea.[39] For the latter brought with them new arts, both industrial and agricultural, including rice-culture. This precious flood of immigrants came as a result of the scourges which periodically blight the populations of the neighbouring continent, — famines, revolutions, wars at home and abroad. The legendary land of Cipango became a refuge from such calamities, and thereby frequently added to its population. Such has often been the destiny of islands when continents are in trouble. In Europe, such was the rôle of the Ionian islands at the time of the Turkish invasions.

Except for an increase in number of cities due

[38] During the first century after Christ the wide plain of Tokio was still inhabited by these men of coarse features and abundant hair, alien in appearance to the Japanese. But as early as the fourth century the people of Yezo began to feel the influence of the Empire.

[39] Chinese and Korean immigration began as early as 219 B.C. The numbers increased during the following centuries. (Count Yanagisawa, *op. cit.*)

mostly to the recent growth of big industry, the dense population of Japan is intimately connected with cultivation of paddy-fields and of the tender crops (tea) which find shelter on the lower slopes of the hills. Minute apportionment of land in small parcels hemmed in by mountains, irrigation insured by monsoon rains, fertilizer supplied by fish débris or by the plants of which the mountains have been stripped, — such are the bases of a rural economy as intensive as it is restricted in area. There is little or no live stock, no exploitation of the mountains. To the Japanese, the flower-mosaic of herbaceous plants (*hara*) upon the hillsides is merely a source of supply of fertilizer, perhaps also of aesthetic enjoyment, the raw material of art. One discovers not without surprise that in the three great islands where Japanese civilisation has developed and whose population has a density comparable to that of England and northern Italy, the area under cultivation is but one-seventh of the total.[40] But the type of cultivation is intensive gardening with two harvests a year, even three in the southwest. The Japanese, being an imitator, is even more particular than the Chinese in his choice of areas for improvement.

In Japan density diminishes gradually on approaching the fortieth parallel (northern Hondo) and in the island of Yezo it has fallen to less than

[40] Cultivated land 15% of the total area. (Dr. S. Honda, *L'agriculture au Japon*, Paris, Exposition Universelle de 1900, p. 20.)

twenty inhabitants per square kilometre. The same sudden decrease is found on the continent north of latitude 40°, beyond the plains of Peking and of the coast. During the three centuries in which the plains of the Liao, at the foot of the Manchurian mountains, have been subject to Chinese influence, it has not advanced farther than the province of Mukden. The latter has a density lower than that of mountainous Korea,[41] and farther north, at about 45°, in the province of Girin, the relative density shrinks to an insignificant figure. Thus the great human agglomerations in Asia cease at about the same latitude where, in Europe, they begin to increase in density. Is nature alone at fault? Without doubt the severity of the continental climate which even in southern Manchuria makes all but spring wheat impossible, has something to do with it; but improved methods of agriculture would have had a great opportunity for development in these parklands, a combination of meadows and woodland characteristic of the province of the Amur, more than likely approximating the primitive European type of vegetation.

VII. CONCLUSION

The fact is that this Asiatic limit of great human agglomerations is the boundary fixed by their type of civilisation. Chinese, like Japanese, went as far as they could with their traditional methods, the ex-

[41] Korea; 80 inhabitants per square kilometre.

tremely detailed, meticulous agriculture with which long habit had made them familiar. To all the agricultural communities in the regions which we have been considering, — from the boundaries of Libya to those of Manchuria, — the control of water-supply, both of streams and of rainfall, and the practise of irrigation on a larger and larger scale, have been the great factors in increase of population. This type of agriculture, much restricted in oases and confined to a narrow fringe along the mountains of central Asia, found in the plains of the Ganges and in China space for unlimited expansion. Both became mighty centres of attraction to man, an attraction felt throughout the entire insular periphery of eastern Asia.

The peculiar setting within which all these societies have developed is geographically different from that which determines the boundaries of the dense populations of Europe. Modern transportation-methods are favourable to mutual interpenetration, and may, in the long run, lessen the differences; but it is probable that the people will remain substantially as they are at present. Communities dependent chiefly on industry and cities have, in many respects, habits of life different from those founded upon the coöperative agriculture of communities grouped in families or villages.

The latter have an archaic quality which suggests the earliest efforts of the human race to establish

community life. The wealth of production resulting from an ingenious control of water-supply in climates mild enough to have a year-round growing season, enabled large groups to live together in a small space. Regulation of the water-supply for the systematic tillage of crops, succeeding one another at brief intervals, helped the inhabitants to concentrate and to form groups, as, in primitive ages, the use of fire had facilitated their dispersal over almost the entire globe. Both of these primordial inventions have played a part in the present distribution of our race. It is because groups expanded sporadically across the continents, from earliest times, that there is today so much diversity and inequality, otherwise inexplicable, in their stages of development. It is because irrigation, having obliged men to assemble at certain definite points, leading them thereby to make further and further improvements, that certain agglomerations were not obliged to await the era of modern transportation in order to become great and powerful.

These initial impulses set in motion and directed the geographical development of humanity. One might say that for each stage of development there is a corresponding fresh grasp of possibilities or appropriation of natural resources. It is by the power of invention that man, today as formerly, is still continuing to make for himself a larger and larger place in the sun.

CHAPTER IV

THE EUROPEAN AGGLOMERATION

I. BOUNDARIES

Of the four great human agglomerations, — India, China, Europe and the United States, — the European group is at present the most important. From the point of view of distribution, Europe is a centre whose influence is felt throughout the world. And in point of numbers and economic importance it outweighs any of the others.

Such a numerical superiority is only recent. It is probable that at the beginning of the nineteenth century the population of Europe was not so great as that of India or of China; the most reliable estimates placed it at about 175,000,000.[1] Previous to losses caused by the war, — the extent of which is at present unknown, — it was estimated in 1914 at 448,000,000, an increase of about 150 per cent in little more than a century. The mean density, which was about 19 per 100 in 1800, amounted to more than 45 per 100 in the past few years. It is true that an average which vaguely includes the whole of Europe loses

[1] E. Levasseur, *Statistique de la superficie et de la population des contrées de la terre. Première partie: Europe* (*Bull. Institut Intern. de Stat.*, Vol. I, parts 3–4, 1886, pp. 110 *et seq.*).

much of its value. A more significant fact brought out by this historical retrospect is that, about 1815, no considerable area on the European continent had a density comparable to that of the Lombard-Venetian kingdom, or 90 inhabitants per square kilometre: agricultural wealth, the ancient legacy of great public works, was the explanation of this higher density. The population of that region has notably increased during the past century. But at the present time, Belgium, the Rhine provinces and Saxony, not to mention Great Britain, all have a greater density than Lombardy.

So distribution has changed as well as the total figure. Centres of density have been displaced. Here is a constantly changing phenomenon whose influence is transmitted from one country to the next. For during the last half-century or thereabouts, the growth of population in eastern Europe, notably in Russia,[2] has been very rapid. Probably inhospitable climatic conditions will prevent Europe, as a whole, from sharing in this development; but the European organism is in such a condition that its motor nerves today are very active, even to the farthest extremities of its various members.

The boundaries of the European agglomeration, at least for the present, might be drawn on the north

[2] According to E. Levasseur, the increase in population of Russia in Europe between 1830 and 1908, amounted to 186 per cent, more than twice that of Great Britain during the same period. *La répartition de la race humaine sur le globe terrestre*, (*Bull. Institut Intern. de Stat.*, XVIII, part 2, 1909, pp. 48–63).

at about the sixtieth parallel. North of that latitude, throughout whose entire length there is a succession of large cities,[3] — outposts as it were, — stretches a vast realm of about 2,500,000 square kilometres in which the density of population does not at most exceed three inhabitants per square kilometre.[4] And yet, this whole region, bathed on the north by a sea which is open for most of the year, has had an attraction for neighbouring peoples for the last ten centuries at least. First it was fisheries, then, in the course of time, lumbering and the fur-trade, and now mines and the development of water-power. The exploitation of these new resources has brought about an appreciable increase in the population of these "extremities of the inhabited world (*oikoumene*)" during the last half-century. As in all new countries, seaports have been the chief beneficiaries; two-thirds of the Norwegian population are on the coast, and there is a relatively high proportion of urban population in Scandinavia, also in Finland.[5] But the sources of food-supply are too scant to leave much margin for growth; the rate of emigration, — which increases there at least as rapidly as the birth-

[3] Bergen, 77,000; Christiania, 242,000; Stockholm, 386,000; Helsingfors, 161,000; Petrograd, 2,133,000.

[4] Northern Norway; northern Sweden (Norrland); northern Finland; governments of Archangel, Olonetz, Vologda.

[5] In Finland, out of a total population of about three million, 429,000 live in cities of over 20,000 inhabitants. (*Société de Géographie de Finlande, Atlas de Finlande*, 1910.) The proportion is even larger in Norway.

rate, — and even occasional famines, work together to keep it down.

On the east, the European agglomeration is bounded by a line having at least as much of an historical as of a geographical significance. It reaches the saline steppe, without touching the fertile black-earth region. It might be thought of as the fluctuating line across which swings the pendulum from regions of settled population to those of more or less nomad groups. It is marked, like the northern boundary, by a line of rapidly growing cities, united by the Volga.[6] Beyond that line, in the governments of Ufa, Orenburg and Astrakhan, throughout an area equal at least to that of France, the mean density of population on the average does not exceed twelve per square kilometre. The sharp contrast between this thinly populated region and those of rapid and continuous growth which extend right up to the western bank of the great river, marks the ultimate eastern reach of European civilisation. This has advanced successively by a chain of frontier cities, a bulwark against savagery; and rivers have afforded protection to the growing cities. First, the Rhine and the Danube, then later, when the activities of Rome were again resumed by the Carolingians and the Holy Roman Empire of the German Nation[7]

[6] Kazan, 194,000; Samara, 144,000; Saratof, 235,000; Tzaritzyn, 100,000; Astrakhan, 162,000.

[7] See *Epitome of Ancient, Mediaeval and Modern History*, Carl Ploetz, Trans. by W. H. Tillinghast, Boston, Houghton Mifflin Co., 1884, p. 193. — Translator.

(*le Saint-Empire germanique*), the Elbe, the Saale, the Elster; and, still later, the Oder, Vistula and Dnieper, were followed in turn by lines of communicating cities upon their banks. Ports of entry and of exit between two worlds they were, also centres of religious propaganda, fortresses and places where fairs were held and commerce was active. Merseburg and later Leipzig; Magdeburg and Hamburg; Breslau and Danzig; Riga and Kiev, mark successive lines of advance. In the development of Europe they anticipate the rôle of the commercial cities which, from Nijni-Novgorod to Astrakhan, subsequently limited the relations between eastern Europe and the steppes to transportation on the Volga.

The city has its own special rôle in the development of population. It is a political organ, a focus of contacts, a nodal point, as it has been called. It is an expression of different phenomena from those expressed by the village; that is why it can exist independently of the village. America and Australia are recent examples where great cities are working out their destinies without the retinue of smaller towns which accompanies them in Europe. There they are fitting-out stations from which the inhabitants hurry forth to new conquests.

II. POINT OF DEPARTURE AND CONDITIONS OF EXPANSION

It seems, then, that more than two-thirds of the population of Europe forms a compact block of almost uniform high density. Parts of this area are still thinly populated, but they are being encroached upon from every side, and are more and more confined to such undesirable places as high mountains, forests or swamp-lands. All interstices between the serried ranks which are closing in upon them are steadily diminishing. In short, the mesh of this fabric has no open tracts comparable to those between India and China, — or in India itself, between the Punjab and the country of the Mahrattas, or between Bengal and Carnatic.

The Asiatic agglomerations were created and have grown up under the influence of one dominant cause, that of the monsoons. Centres of dense population, — scattered at first, — have gradually approached one another and finally merged, thanks to various contributing causes such as sunlight, rivers and rainfall, all of which relentlessly over-stimulate the productive soil. It is difficult to delimit human phenomena with any precision, but the above great agglomerations appear to lie approximately between 10° and 40° north. The European agglomeration, on the other hand, begins where those in Asia end. The process which has resulted in assembling in

Europe nearly one-quarter of the population of the globe, has in general operated in latitudes and under climatic conditions whose demands are far greater than those of tropical or sub-tropical countries. On this account it is unique in the history of human occupation. Herein lies its difference not only from the ancient agglomerations of eastern Asia and Egypt, but also from those which are in process of making in several American countries, — although it is true that, since the latter are still in the initial stages, it is difficult to predict what their future dimensions may be.

The series of events which has led to the accumulation in this Old World peninsula of the largest population groups on earth, has had a more complex evolution than those whose progress we have thus far tried to elucidate. The prime factor, however, here as elsewhere, appears to be the abundance of plants suitable for human consumption. In this respect, Europe, especially in those parts which were not covered by glacial waste, is no less richly endowed than the regions which, from the botanist's point of view, have contributed most generously to the supply of alimentary plants, namely, India, the Sudan and China.[8] Some of the most useful cereals, such as

[8] Alphonse de Candolle, *Origine des plantes cultivées*, Paris, fourth edition, 1896. See in the *Geographische Zeitschrift*, Leipzig (Vol. V, 1899), an essay on the classification of useful plants according to their place of origin, by F. Höck. His conclusion is that " the Mediterranean countries seem to be among the most richly endowed," (p. 402).

wheat and barley, and many vegetables, such as beans, peas and lentils, in the Mediterranean region appear to be either indigenous or very early importations from neighbouring districts. Commerce, early developed along the shores of the Mediterranean, facilitated the acclimatisation of plants native in adjoining regions. Midway in this sea, moreover, luxuriant Sicily seemed destined by nature to serve as a distributing centre. The total food resources of Europe have been gradually increasing since prehistoric times, and of these not all, but by far the greatest number have been furnished by the Mediterranean region. The wide variety of food-plants mentioned by Pliny the Elder as habitually used by sub- or trans-Alpine people is very remarkable. His account is confirmed, furthermore, by prehistoric finds. Eatables obtained by hunting or by stock-raising are not included, because only modes of life favourable to the formation of a dense population are under discussion.

As far as comfortable living conditions with their consequent advantages and disadvantages are concerned, the European countries south of the fortieth parallel are similar to the parts of Asia which have been favourable to expansion. With them in mind, Mirabeau could refer to regions where the "endeavour of the worst governments on earth could not succeed in preventing the population from increasing." As a matter of fact, it has not always been on the increase in the Kingdom of Naples and in

southern Spain. It has had many temporary setbacks. But the fact remains that, under favourable circumstances, it has constantly shown a tendency to increase. Only in the large cities of southern Italy and Spain can a proletariat be found, living on very little, such multitudes as those which over-burden India and South China,[9] or even the fringe of cities at the foot of the mountains in eastern Turkestan. True, as needs are few, that of daily bread assumes great importance; but even this question loses its insistence at certain seasons and is very easily settled. "In Murcia," wrote de Laborde,[10] "during the summer, a servant is not to be found. Many of those who are employed leave their posts at the beginning of the season of fine weather when they can easily procure salad, fruits, melons, and especially pimento. Such commodities are sufficient for their needs." Compare this testimony with that from the oases of Turkestan, situated at about the same latitude, in regard to the inhabitants of Kashgar, Yarkand and Khotan, who preserve the ancient traditions of Iranian agriculture. "During the summer months," says Semenov,[11]

[9] Twenty years ago the food of a weaver in Chengtu, in the populous province of Szechwan, cost eighteen and a half centimes a day. (Chambre de Commerce de Lyon, *La mission lyonnaise d'exploration commerciale en Chine*, 1895–1897, Lyon, 1898, Part II, p. 269.)

[10] Al. de Laborde, *Itinéraire descriptif de l'Espagne*, Paris, 1828, p. 112.

[11] Commission Impériale de Russie à l'Exposition Universelle de 1900, *La Russie Extra-Européenne et Polaire*, . . . by P. de Semenov, Paris, 1900. — E. Huntington, *The*

"fruits and melons are plentiful enough to take the place of public charity." In such localities, furthermore, this periodical manna puts a premium on laziness and *dolce far niente*. Nature takes it upon herself to provide with least possible effort and, as it were, at cut rates, the necessities whose production is a burden to society in other latitudes.

But the European countries in which man is free from ceaseless toil are the exception. Hardly more than a hundred kilometres from the shores of the Mediterranean the climate begins to show signs of severity. Since it affects peoples living near the Alps, in the Balkans and along the Danube, how much more must it have influenced those early groups, just visible here and there through the dawn of history, within the fertile belt of land along the fiftieth parallel which extends by way of the Danish archipelago into southern Sweden! In view of the long winters, fog and inclemency incompatible with life in the open, — dear to the Neapolitan of our day as well as to his Pompeian ancestors, — shelter, clothing, heat and light greatly complicate the problem of existence. Climatic conditions required that floating draperies should be replaced by close-fitting garments, the *sagum* and Gallic *bracae*; also that the house should have a pointed roof, steeply inclined so as to provide a run-off for rain. The dwelling

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Pulse of Asia, Boston and New York, 1907. — F. Grenard, *Le Turkestan et le Tibet* (J.-L. Dutreuil de Rhins, *Mission scientifique dans la Haute Asie*, 1890–1895, Part II, Paris, 1898).

assumes greater importance in the affairs of daily life: it is no longer a temporary shelter where one may sleep after a day passed in the market-place, but an abode where winter work is carried on, and home industries fostered, — a house, a home, with all the meaning and sentiments which that word awakens. To "increase and multiply" under such conditions becomes more and more difficult. A combination of time, wit and perseverance is necessary for its fulfilment.

North of the fortieth parallel the need of shelter and clothing, as well as food, has to be reckoned with, — a state of affairs comparable to the additional weight with which certain competitors in a race are handicapped. Many sociologists, beginning with Le Play, have undertaken to analyze the budgets of rural or urban workmen in different European countries.[12] From many examples those of the regions where increase of population is greatest at the present time have been chosen preferably. In Belgium, Saxony, Westphalia (Solingen) and Sheffield the distribution of expense is approximately as follows: 60–65% for food, 15–20% for clothing, 12% for housing, 5% for heating and lighting. Accord-

[12] F. Le Play, *Les ouvriers européens*, 2d edition, Tours, 1877, Vol. III, *Les ouvriers du Nord.* — Ducpétiaux, *Budgets économiques des classes ouvrières en Belgique*, Bruxelles, 1855. — For a more recent period, Ernst Engel, *Die Lebenskosten belgischer Arbeiter-Familien. . . . Bull. Institut Intern. de Stat.*, IX, Part 1, 1895, pp. 1–124. — M. Rubin, *Consommation de familles d'ouvriers danois* (*ibid.*, XIII, Part 3, 1903, pp. 21–79).

ing to recent estimates from Denmark, a very prosperous country, the amount spent for food per family is not more than half the total expenditure, proportional amounts for other items remaining practically the same.[13] The same observer ventures to make a generalisation that the smaller the budget, the larger the proportional expense for food.

The significance of this observation can be further increased. When the weaver of Chengtu has deducted from his meagre wages the sum necessary for his bowl of rice, it is highly probable that the remainder, if such there be, will go to the gambling den. When the advance in the price of cotton caused by the American Civil War had enriched the farmers of the province of Dharwar, India, the profits, it is said, chiefly benefited the village jeweller. Lastly, is it not a well-known fact, even in the countries of southern Europe, that love of fine clothes and of gambling (lotteries) exceeds all other uses of possible income? It seems, then, that there are climates in which the average man, — who after all makes up the bulk of the population, — after satisfying his hunger, can follow his inclinations almost with impunity. Social behaviour which results, in our climate, from what Montesquieu calls "physical necessity," is quite different. Duties multiply along with necessities, and eliminate, or at any rate greatly diminish, that form of parasitism which in less severe climates results in an increase of beggars and va-

[13] M. Rubin, *art. cit.*, pp. 32, 64.

grants. Here the beggar is no longer "a being loved of God." [14] The exterior of the house as well as of the person demands much thought as to what will make for comfort, well expressed by the English phrase, "standard of living."

Nevertheless, it requires effort to meet not only these demands, but also others in modern life such as taxes, proper hygiene, education, recreation, etc. More resources must be created in order to keep pace with more duties. Have our countries of central and northern Europe such means at their disposal? They do not at first glance seem suited by nature to support such multitudes as those living along the banks of the Blue River (Yangtze-kiang) or the Ganges. If, notwithstanding, they equal or even surpass them, it is because they have been able to make better use of their natural resources than have Asiatic societies. Products of the sub-soil have been utilised as well as those of the soil. Agriculture has been supplemented by cattle-breeding. And lastly, the aid of science has been sought. The growth of the European agglomeration thus appears to be an achievement of intelligence and of method almost as much as a natural phenomenon.

III. RÔLE OF COMMERCIAL RELATIONS

Such progress has not been the exclusive privilege of one race. Not that it would be necessary to ques-

[14] F. Grenard, *op. cit.*, p. 165.

tion the superior qualities of which man has given evidence in Europe in making more intensive use than elsewhere of all the resources. But in Europe the natural connexion of all its various parts must not be forgotten. Because of its gradually tapering, peninsular form and of its relatively small size, because of passes which minimize the barriers of mountain-chains or massifs, and because of its natural river-highways, because of all these things, very diverse and heterogeneous peoples, placed there by circumstance, are never long in entering into mutual relations. Provincialism, a cause of stagnation, cannot long endure, and consequently the results of progress made by some are not withheld from others. The number of localities not taking part in the general movement is gradually diminishing, and sooner or later each eventually falls into line with the universal economic advance.

All that we know of the history of Europe tends to emphasise the rôle of imitation and example in the march of civilisation.[15]

The great increase in population and wealth during the five centuries preceding the Christian era, typified by Hallstattian finds and those of La Tène,

[15] The late M. Woeïkof was much struck with the force of example. In an unpublished letter before me he writes: "As far as I know the change from nomad to farmer does not occur except under the influence and in imitation of agricultural neighbours. For instance, the Magyars, nomad fighters, have become farmers following the example of their Slavic and Germanic neighbours."

north of the Alps, and in northeastern Gaul, coincides with expanding Mediterranean relations.[16] Imitation of Macedonian coins and Etruscan objects, the creation of a mixed art "of provincial Roman style" shown in finds on the banks of the Rhine and of the Danube,[17] are signs of an economic transformation of the social state.

It may be concluded from evidence given by Strabo [18] that an increase in population was one of the first results of Roman peace in Gaul, although those fertile regions of the west could not in the long run escape "the dearth of men," [19] — depopulation we should call it, — from which Greece and other regions having borne the like burden of a long struggle toward civilisation, were already suffering. The stimulus which central Europe had received was felt in turn by northern Europe about the fifth century, A.D., when navigation and agriculture had at their disposal a better equipment than that of the early

[16] J. Déchelette, *Manuel d'archéologie préhistorique . . .*, Vol. II, second and third parts, Paris, 1913–1914, pp. 629, 650, 914, etc.

[17] See J. J. A. Worsaae, *La Colonisation de la Russie et du nord scandinave et leur plus ancien état de civilisation, . . .* (*Mém. Soc. R. des Antiquaires du Nord*, new series, 1872–77, pp. 73–198).

[18] *The Geography of Strabo*, Book IV, 1, 2; *id.*, 4, 3 (where the word πολυανθρωπία recurs).

[19] "In our time all Greece was visited by a dearth of children and generally a decay of population." *The Histories of Polybius*, Vol. II, XXXVI, 9, E. S. Shuckbugh, London, 1889. — Plutarch expresses himself in almost the same words.

bronze ages.[20] The Scandinavian North then became the centre of the ferment of peoples which had stirred the Celtic world four or five hundred years previously.

One must bear the above underlying causes in mind in order to grasp the idea which is properly the subject of our study, — the establishment in Europe of the most important human group on earth today. It is the result of long-protracted effort, and has advanced not continuously but by fits and starts, — for it has suffered catastrophes and periods of retrogression, but its stages of growth are nevertheless well marked and it is characterised on the whole by a progress far greater than most thinkers of the eighteenth century ventured to predict.[21] The area of intensive occupation has been increased by means of successive additions whose approximate dates can be determined. In this series of conquests, the chief adversaries have been forests, — which have been cleared; marshes, — which have been drained;

[20] J. J. A. Worsaae (*art. cit.*, and *La civilisation danoise à l'époque des Vikings*, in *Mém. Soc. R. des Antiquaires du Nord*, new series, 1878–1883, pp. 91–130, notes the increase of population during the second period of the iron age (450–700 A.D.). See C. Engelhardt, *Influence de l'industrie et de la civilisation classiques sur celles du Nord dans l'antiquité* (*ibid.*, 1872–1877, pp. 258 *et seq.*).

[21] "It is supposed that not less than five hundred years will be required to double the number of inhabitants of Great Britain, and of most other European countries," said Adam Smith. (*Inquiry into the Nature and Causes of the Wealth of Nations*, Book I, chap. VIII.)

mountains, — which have been utilised for pastoral pursuits; and alluvial deposits, — which have been wrested from the sea. Finally, a century and a half ago, the dawn of big industry began to break in that part of Great Britain where coal and iron were found close together. The pioneers in developments then taking place near Birmingham, Manchester, Sheffield and Newcastle, recruited more than one promoter from the social environment which we attempted in the preceding pages to describe from the point of view of the workman's budget. The example of England was followed by the continent. The needs of big industry resulted in an unheard-of growth of transportation with the result that the march of commerce is not slackening in the slightest, — in fact it is constantly advancing.

That a period of unparalleled mechanical invention should give rise to an unprecedented increase in population is a natural law, one which may throw some light on the type of causes having most influence upon the growth of population. It means an awakening of initiative, and that greater energy and intelligence are applied to the development of natural resources. The creation of new wealth demands and summons to its aid more human faculties, with increased growth as a result. But as it spreads the flood grows shallower. It happens sooner or later that such wealth gives rise to new needs, that it introduces habits which in turn, little by little, affect the progress of colonisation. Various actions

and reactions follow as time goes on. Progress carries its own checks. In face of facts of such importance, it is to be expected that the phenomenon of population, when surveyed in its entirety, presents very varied aspects.

CHAPTER V

THE MEDITERRANEAN REGION

When relations were first established across the mountain-barrier bordering the Mediterranean, the ultramontanes thought of the south as a land of fruit, while the Mediterranean peoples regarded central Europe as a land of forests. The distinction was founded on a basis of fact, but what appeared to be natural fact was in reality the result of a transformation brought about by prolonged human effort. We have previously described the mode of life characteristic of the Mediterranean region as follows: "Here the garden rather than the field was the focus of sedentary life."[1] It should be said that the garden, or rather orchard and vineyard cultivation, was, in these regions, the reason for coming together. It was and has remained the principal factor in distribution, — except for cities.

I. VACANT AREAS

Physical nature in the Mediterranean region is equally hospitable to modes of life which are vastly different in their effect upon the population: cultivation of cereals, for instance, such as barley or wheat;

[1] P. Vidal de la Blache, *Les genres de vie dans la géographie humaine* (*Annales de Géographie*, XX, 1911, p. 205).

of woody plants, such as the vine, figs, and olives; and pastoral pursuits, especially the raising of sheep and goats. This classification has a very ancient sanction, referred to by Cicero as a legal formula of long standing.[2] The distinction between "seeded land" and "planted land"[3] was current among the ancients. But one is tempted to inquire whether arboriculture is not a branch of agriculture. As to pastoral life, it is not only different, it is antagonistic by nature. This difference is the basis of a contrast which impressed observers from Thucydides to Strabo, and which has persisted, to some extent, until our own day.

In the space between the folded Iberian and Provençal chains, as well as Apennines, Dinaric Alps and Pindus, valley-plains and mountains interlock. In winter the mountains are covered with snow, but they provide fresh pasturage in summer. The plains, which are hospitable in winter after the refreshing autumn rains, in summer go through a period of arrested growth, because of drought, sometimes lasting as long as two months. Consequently live stock, easily transported from one place to another, — in the Mediterranean region the characteristic form of wealth (*pecunia*), — find pasturage in plains and mountains alternately. This interdependence resulted in a pastoral régime whose development is not

[2] *Ager, arvus, arbustus, pascuus* (*De Republica*, 5, 2).

[3] Γῆ σπόριμος and γῆ πεφυτευμένη. (Xenophon, *Hellenica*, 3, 2, 10. Also the *Oeconomics*).

difficult to picture. The flocks were driven from heights to lowland or *vice versa*, according to the season. The journey was at first confined to the immediate vicinity; then, gradually, as pastoral communities strong enough to sponsor the migrations developed, considerable distances were covered.[4] And so the régime of *transhumance* became established between Dinaric Alps and Dalmatian coast, between Pindus and plains of Thessaly, between Abruzzi and Roman *campagna* as well as the Tavoliere di Puglia, and finally, between the Leon and Teruel Mountains and the plains of Andalusia. The flood of shepherds and flocks descending periodically upon the plains was a hindrance to the pursuit of agriculture there. The consequence was that in the plains where the results of this régime were most extreme, labourers appeared during two short seasons only, in October for sowing, and in June for harvesting. This explains the fact that in the plains where such a régime held, the close bond between tiller and soil resulting from daily painstaking contact, could not exist. Furthermore, small holdings would be ruined by war, however brief the periods of conflict and dis-

[4] In the pastoral industry of Spain herds were classified as stationary (*estantes*); local, those which do not leave the vicinity (*riveriegos*); and "*transhumantes*," those which migrate from one end of the kingdom to the other. (J. Goury du Roslan, *Essai sur l'histoire économique de l'Espagne*, Paris, Guillaumin 1888, *in oct.*, [VI] + 355 pp.) — See André Fribourg, *La transhumance en Espagne* (*Annales de Géographie*, XIX, 1910, pp. 231–244, 3 fig., maps, 1/5,000,000, pls. 14, a and b).

turbance. They have all been swept away in the tumult, and have given place to a system of *latifundia* (large estates) which in Spain and in Italy still is a burden to some of the districts which used to be prosperous, and where the inhabitants might otherwise still live in comfort.

This is one of the reasons why the density of population around the Mediterranean is not greater at the present time. It is fairly dense on the plains, especially in southern Europe, and still more so in North Africa where French colonisation has not been unsuccessful. But the complex interweaving of physical and historical facts results in keeping down the population so that there are bare spots here and there,— vacant areas which might be called a series of anomalies negative in origin.[5]

II. RÔLE OF TREE CULTURE

The case is different in localities where arboriculture is practised. These were thickly settled at an early date, have continued to grow, and have kept in reserve for emergencies, as it were, a dense population from which not only neighbouring towns but even overseas' emigration constantly draws recruits.

[5] Greece: Province of Phthiotis, 24 inhabitants per square kilometre; province of Larissa, 25; mean for the entire kingdom, 41. Italy: Province of Foggia, 70 inhabitants per square kilometre; mean for the kingdom, 126. Spain: Province of Huelva, 31 inhabitants per square kilometre; province of Cordova, 36; province of Seville, 42; mean for the kingdom, 40.

Observers who have been intrigued by problems of civilisation since classic antiquity, have well understood that this type of culture was not elementary and spontaneous, but that it presupposed progress and a higher stage of development. Like all progress of this nature it was a coöperative undertaking which spread from group to group as climate warranted. Its centre of origin was located without question in the part of the Mediterranean region nearest the great ancient civilisations of Euphrates and Nile. Its vehicle was maritime commerce, proved by prehistoric discoveries in Crete and in the Aegean Sea to have been one of the oldest and most important facts in the geography of civilisations. Finds of Cretan or Aegean vases as far away as Upper Egypt, and, on the other hand, finds of Egyptian objects in Crete, open wide vistas reaching back to the first Pharaonic dynasties, perhaps even farther. At a time when the core of the island of Santorini had not yet collapsed as the result of volcanic activity,—at least forty centuries ago,—its inhabitants were carrying on a trade in pottery with the outside world; their crops included the olive, barley and various kinds of legumes.[6] In these primitive relations may be found the germ which, depending on conditions of time and place, has grown,

[6] F. Fouqué, *Santorin et ses éruptions*, Paris, 1879, Chap. III, "*Constructions antéhistoriques.*"—The different articles to which we have referred were found during the excavations of the French expedition in structures buried under thick layers of ashes.

giving rise to an increase of population around the Mediterranean. Like any progress which inspires additional energy in the group as a whole, it takes place near the contact of civilisations in different stages of development, but working on a common basis.

The European shores of the Mediterranean suffer from seasonal drought; but, unlike wholly arid regions, rainfall in winter, spring and autumn is sufficient, — except in regions of karst topography, — to hold permanent reserves of moisture in the subsoil. These are tapped by deep-rooted trees and bushes. The subsoil is very important in Mediterranean agriculture.[7] While the importance of irrigation cannot be exaggerated, it is not the sole dispenser of wealth and population in sub-arid districts. This slight climatic difference explains why, in southern Europe, dry-farming has always been carried on side by side with irrigation.[8] The latter required extensive coöperative construction-works and an organisation developed only after prolonged effort, — while areas with a poor run-off were in need of costly systems of drainage.[9] But in contrast to the foregoing, arboriculture has been able from the first to thrive

[7] What is known as "dry-farming" in the United States appears to be a revival of the methods of Punic agriculture.

[8] *Secanos* and *riegos* on the Spanish coast; *Aspres*, *Regatiu* or *Rivieral* in Roussillon.

[9] Drainage operations or attempts at such are described in Greek legend and history. But it is certain that they came long after irrigation-works. The oldest drainage known in

on soil whose surface is dry but whose subsoil holds sufficient moisture. It is noteworthy indeed that the plants of this type which, because they have been under cultivation since antiquity, seem to have become predominant at an early date, — vine, fig and olive, also the almond, — are among those not requiring irrigation. These various considerations lead me to conclude that the regions with a dry surface and humid subsoil are those where the most ancient Mediterranean type of intensive agriculture and dense population originated.

One of these, both by position and by nature, preeminently fits the description, — the calcareous plain at the southeast extremity of the Italian peninsula, which, like a bridge-head advances to meet the orient. It is a part of the region which the Greeks long knew by the name of Iapygia and which the Romans called Apulia, which still continues, not without reason, to be referred to in the plural as *le Puglia*. In this diversified country, the littoral strip which extends from Barletta to Bari, and even beyond to Brindisi and Lecce, was destined from the beginning to be a centre of population,[10] judging by the enormous

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Roussillon took place not earlier than the twelfth century. (J.-A. Brutails, *Etude sur la condition des populations rurales du Roussillon au Moyen Age*, Paris, 1891.) Did it not require nearly seven centuries, beginning with the eleventh, to complete the drainage of the Valle di Chiana?

[10] The mean density of the province of Bari (175 inhabitants per square kilometre) and of that of Lecce (120 inhabitants)

quantity of vases which have been found there. In spite of the different course events have taken, the country still remains a promised land whose advantages wretched government throughout the ages has not been able to paralyze. Two parallel lines of cities, one on the coast, the other ten kilometres inland, hem in the hot, shimmering plains, where, beneath the sifting shade of olive, fig and peach trees, — and many others, — vineyards are constantly gaining ground. Their culture is not, however, anything like as universal as in a less favoured rival country, — the *Coustière* of Bas-Languedoc, — where the equally dry soil is entirely given over to cultivation of the vine.

III. THE "RIVIERAS"

Maritime commerce and Greco-Phoenician colonisation pushed the cultivation of these eminently lucrative crops to the outermost limit of regions where they were capable of thriving. Except for the very early general awakening, of which we have noted the first hints, it would be hard to understand how this advanced mode of life spread from shore to shore, giving rise to all sorts of different combinations. Certain coasts, both as to slope and exposure, are natural espaliers, on which man had but to hew out

is hardly representative of that of the two populous zones (1) Barletta, Bari, Lecce (2) Andria, Bitonto, Putignano, etc., bordering the almost desert zone of le Murge.

the steps. And, moreover, sheltered from the mistral and the north wind, there are little sandy beaches within easy reach of one another, where the mild breezes and the regular system of winds are conducive to a life of coast-trading and fishing. Such, preëminently, is the zone of Liguria, which is popularly known by the characteristic name of "Riviera," — "Occidental Riviera" from Genoa to San Remo; "Oriental Riviera" from Genoa to Spezia.[11] There, mountains hug the coast, envelop it, so to speak. On slopes facing the sea, shimmering white between orchards and olive groves, lies the principal village (*bourg*), communicating with the beach by steep streets of steps where donkeys clamber up and down; while shut in between two promontories in shape like the arc of a circle, — like a half-stretched bow-string, "*une corde à demi tendue*," as Reclus says, — lies the little beach (*marine*) where boats can be drawn up on the sand. *Bourg* and *marine* are closely related, they are in full view of one another, they complete one another, and often go by the same name. From this dual character springs a mode of

[11] Density in 1914: province of Genoa, 273 inhabitants per square kilometre; province of Porto-Maurizio, 127 inhabitants. — According to a map of population-density in the province of Genoa in 1881, the zone of over 200 inhabitants per square kilometre skirts the shore without a break from Sestri Ponente to Sestri Levante. It extends in a point for twenty kilometres north of Genoa. The zone of more than 100 inhabitants does not generally reach farther inland than five kilometres. (*Bull. Institut Intern. de Stat.*, III, part 2, 1888, pp. 159–175.)

life favourable to family coöperation, uniting as it does seafaring pursuits with those of a type of agriculture requiring more care than muscular effort. This is the chief attraction, among many, which has lured men to this crowded fringe of cabotage and fishing.[12] The original model should be sought in Syria, possibly, on the section of coast extending from south of Tripoli to Mt. Carmel. For there a whole succession of ancient Phoenician cities, — nurseries of colonies which swarmed over all Mediterranean shores, — stretched from Byblus (Jebeil) to Tyre. Those cities have suffered the fate that overwhelms most creatures of history; but from one end to the other of the succession of little harbours is a line of numerous villages, witnesses and sole survivors of the dense populations which swarmed upon this entire coast.[13]

Such contrasting conditions, — orchard and *marine*, — bring about a combination peculiar to Mediterranean life, as a result of which population concentrates at certain parts of the shore and avoids others.

[12] For example: northern coast of the Gulf of Salerno (Amalfi); inner shore of Manissa (Volo). On the eastern slope of the promontory called Cape Corse, sheltered from the west winds, there is a series of *bourgs* and *marines* thirty-five kilometres in length, whose population exceeds seventy-five inhabitants per square kilometre, — more than double the average of the island.

[13] On the littoral fringe between Tripoli and Saida (Sidon), the density of population may be estimated at between fifty and a hundred per square kilometre.

This type of Riviera occurs all along the Mediterranean coast in more or less typical form. Of all the communities to which it has given rise that of Catalonia is one of the most remarkable. A nursery of *bourgs* with their attendant *marines* has grown up northeast and southwest of Barcelona: one (Costa de Levante) as far as Cape Creuse, the other (Costa de Ponente) as far as Tarragona.[14] Whatever the changes brought about by modern life with its industries, cities and cosmopolitan visitors, these modes of life still persist, not as survivals, but as expressions of a natural harmony which had encouraged the growth of population.

IV. ALTITUDE ZONES

A fact long characteristic of our Mediterranean region is that dense population is concentrated in the orchard-zone. Above an altitude of eight hundred metres, human establishments are infrequent, except near the southern extremity of this area. Even the villages scattered over the southern slopes of the Sierra Nevada are not usually found above the

[14] In the patriarchal organisation of the ancient *marine* of Catalonia, several owners combine for outfitting and operating a ship. (Ricart y Giralt, *Nuestra marina mercante*, Barcelona, 1887.) "All this part of the coast is covered with villages, farms and country-houses . . . with dependent fishing villages on the shore." (*Instructions nautiques*, No. 968, 1913, p. 186.) Such, in miniature, is the coast of Argelès-sur-Mer, and Collioure, at the entrance of the Gulf of Lions, where the density exceeds 100 inhabitants per square kilometre.

upper boundary of the olive (1200 metres),[15] and although here and there in Sicily large towns at considerable heights do exist, like the twin towns of Calascibetta (878 metres) and Castrogiovanni, the classic Henna (997 metres), the bulk of the population of the island is located between 300 and 800 metres in altitude.[16] This most populous zone is itself subdivided, composed as it is of different elements, all of which have little by little added to its prosperity.[17] The respective boundaries are indicated by lines of buildings. Thus, the lower strip in which the cultivation of citrus plants thrives, appears on the eastern and southern flanks of Etna as a populous belt which seems to be controlled by the 300-metre contour, namely, that of springs which supply water for irrigation. On the clayey Miocene hills skirting the outer arc of the Apennines from Bologna to Termoli, a belt of population concentrated as in southern Italy, but irregularly distributed, exactly corresponds to the zone of the olive, between 200 and 600 metres approximately. Vine and olive are

[15] O. Quelle, *Beiträge zur Kenntnis der spanischen Sierra Nevada* (*Zeitschr. Ges. Erdk. zu Berlin*, 1908, p. 424 *et seq.*).

[16] O. Marinelli, *La distribuzione altimetrica della popolazione in Sicilia.* (*Riv. Geog. Ital.* I, 1894, No. 2, p. 117.) In Corsica, out of 62 cantons, more than half (36) are above 400 metres; only about ten are above 800 metres. So, apparently, the bulk of the island's population lives between 400 and 800 metres in altitude.

[17] The mulberry, with the associated silk industry, which was introduced into Spain during the Middle Ages, and later into France, is one of the crops.

usually found near together, but present economic causes are attracting vineyards more and more toward the plain. This type of terrace-agriculture, becomes prevalent wherever the nature of the soil lends itself to cultivation of the chestnut. With it, the zone of dense population rises also. It is not found below 400 metres, and only above that altitude, — at about 600 or 700 metres, — is it at all common. A succession of human establishments often follows the contour-line along which the olive, with associated crops, gives place to the chestnut.[18] Thanks to this purveyor, waves of dense population have been able to reach their greatest heights on slopes of the Apennines, the Southern Alps and the Cévennes.[19] Today the people are leaving such heights, discouraged by the minute and arduous labour required by this type of agriculture, the terraces of masonry necessitating constant attention and repair. This labour of Sisyphus is no longer within the capacity of the inhabitants, nor does it suit their tastes; so the upper part of the ancient cultivated terraces often has the appearance of a crumbling pile of stones, left to unprofitable pastoral pursuits. There is a sort of vertical ebb and

[18] Clearly marked in Corsica, for example, at Evisa (716 metres). In Vivarais, toward 400–500 metres, chestnut-groves supplant the mulberry and the vine.

[19] The Castagniccia of Corsica, including, at a height of 600 to 700 metres, the valley of Orezza itself, — which corresponds very closely to the canton of Piedicroce, — has a population-density of 90 per square kilometre.

flow in the movements of the population. What was formerly sought in the heights was security, often greater healthfulness; today the pull is in the opposite direction.[20]

V. RÔLE OF MOUNTAINS

Within the zone of heaviest rainfall the mountains bordering the Mediterranean rarely reach an altitude of 3000 metres, but a great many are 1500–2000 metres high. Since the rainy season is in winter, snow falls as well as rain. Snow-fields feed the rivers, swell the large springs, and act as reservoirs, most important during the summer drought. In general, these mountains lack extensive upper slopes where profitable pastoral pursuits could develop as in our Alps. But as *castelli aquae* they encourage human occupation at their base. This rôle of the mountains can be seen from Mt. Olympus in Thessaly to the Sierra Nevada of the Betic chain.

The fragments of chains which rise from the submerged boundary of the ancient lands surrounding the Aegean, furnish classic examples. By virtue of their own influence dense populations have existed since time immemorial at their foot. Ancient Lydia, Bithynia, Thrace and Macedonia, are historic countries with prehistoric roots. At the foot of Mt. Olympus in Bithynia, upon a terrace dissected by

[20] Notably between Cerdagne and Roussillon. M. Sorre (*Les Pyrénées méditerranéennes*, Paris, 1913, p. 410) quotes a Cerdanese proverb: "*Baixer sempre, mountar no*" — always descend, never ascend.

torrential streams, the city of Brusa, abounding in living waters, has a site whose great fertility has always been sought after by man.[21]

Human settlements did not grow up along the marshy banks of the Hermus, the Caystrus or the Meander, at least not to begin with. Affectionate names elsewhere given by men to their rivers, such as Ganges, Nile, Volga, Rhine, here belong to mountains, — for it is at the foot of Sipylus, Tmolus, Messogis, where springs burst forth, and rivulets "drench flowers and foliage, grove and coppice in the constant moisture of a health-giving bath."[22] Much more ancient sites bear such Hellenized names as Magnesia, Philadelphia, etc., further disguised or replaced by Turkish vocables. As political power increased, and commercial relations widened, cities and political capitals grew up either on the coast or on the acropolis-like promontories. For these valleys lead toward the heart of Asia. Sardis, in the valley of the Hermus, was the point of departure for Susa. But previous to the periods under consideration, —

[21] Brusa at the foot of Mt. Olympus in Bithynia (2250 metres in height). Also, Afiun Karahissar, at a height of 1000 metres, on the interior plateau of Asia Minor, at the foot of an andesite rock 1220 metres in height; Manisa, at 50 metres, at the foot of Sipylus (1800 metres); Aidin, at 65 metres, at the foot of Messogis (1050 metres); Alashehr, at 190 metres, at the foot of Tmolus (2050 metres).

[22] G. Radet, *La Lydie et le monde grec au temps des Mermnades*, Paris, Thorin, 1892, p. 14. The same author remarks (p. 38) "the prodigious number of ruins of acropolises and fortified enclosures along the roads of the peninsula."

frequently so troublous, and from which date so many ruins, — the secret of the attraction for man was the natural fertility, the exuberant abundance of the necessities of life. Mediterranean vegetation, sheltered by mountains, steals in along these corridors, vineyards in the midst of orchards, veritable forests of walnut and mulberry, fig and olive.

A close relationship here exists between Europe and Asia, one sanctioned by ethnography. Olympus of Thessaly was also the nucleus of a growing population. North of it, the Karatas chain, about 1800–1900 metres in height, commands the *Campania*,[23] the plain of Pella, capital of Philip the Great of Macedonia, Emathia of the ancients. At the farther end of this plain, Therma, with its warm springs, was the parent of Saloniki. Numerous tumuli give evidence of but one village on the site of Pella, and today the plain looks like a necropolis. But the upwelling streams of water gushing forth from the mountains, fixed some of these sites as permanent, which, once adopted, were never again abandoned by man. All travelers since the time of Cousinéry,[24] have enjoyed describing Vodena, the city of waters,

[23] Vodena (Edessa) is 311 metres high, Niausta 331, Veria 188.

[24] "On the face of the plateau twenty cascades . . . leap to join one another in the valley. . . . In the city the stream is divided into a number of canals, for the public good; and after passing through factories, these streams form . . . cascades, upon the southern slope. Toward the east, outside the city limits, there is a wide meadow, surrounded by gardens, plane-trees,

its Slavic name disguising the Macedonian name, Edessa, and the still more ancient one, Aegae. A rush of water from the interior tumbles in cascades over its travertine terraces, later scattering in a multitude of rivulets, foaming and rising in a mist of spray among the luxuriant orchards. Vodena is at the outlet of the basin of Monastir, the ancient Pelagonia; but from one end to the other of the same chain there is a series of advantageous sites, Niausta,[25] for example, and Veria (Beroea of the ancient Greeks, Karaferia of the Turks). The latter, according to J. Cvijić, are not upon thoroughfares, they owe everything to local advantages. These three cities, so often attacked or devastated, continue to exist by virtue of natural laws which control human establishments. Water is for them a pledge of enduring life; the three alone, remarks an Englishman, "could furnish hydraulic power enough for all the factories of Manchester."[26] While waiting for the fulfillment of this prediction, they have lost the flowering crown of villages above them, destroyed,

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willows, elms," etc. . . . (E.-M. Cousinéry, *Voyage dans la Macédoine*, Paris, 1831, Vol. I, pp. 78–79).

[25] "It must have been inhabited since antiquity because of its sparkling waters and its beautiful vineyards. . . . It seems that this canton was formerly inhabited by the Brygi." (Cousinéry, *op. cit.*, pp. 71–72.) This people was apparently related to the Phrygians.

[26] According to J. Cvijić, *Grundlinien der Geographie und Geologie von Mazedonien und Altserbien. I Teil* (*Petermanns Mitt.*, Ergzbd. XXXIV, Ergzh. no. 162, Gotha, 1908, p. 353).

during the Greek insurrection, by Ali-pasha of Yanina. In the plain below, almost complete solitude reigns.[27]

Mountains not only bring populations into being, they preserve them, once they have been created. Part of the population in the fertile basin traversed by the Struma before reaching the sea, and, farther east, the basin of Drama which is separated from its port, Kavala, by a barrier 500 metres in height, departed to the mountain slopes. The latter (Boz-dagh), advance-guards of the Rhodop mountains, dominate, from a height of about 1800 metres, the low-lying plains whose origin is in part lacustrine. Beside the Roman road (*via Egnatia*) the city founded by Philip is now only a village in ruins; but where running waters come forth, Drama still shows signs of life. There, as at Seres, — mere vestige of a city, — lying quietly upon the mountain-flank like a dormant seed, is the sign of latent power, which is only waiting to blossom once more, when its time comes.[28] That hour will strike when small free properties replace the system of *shifliks* or *latifundia* established under Turkish rule.

Italy, though its history has been far from peaceful, has better preserved its centres of population.

[27] Id., *ibid.*, p. 355.

[28] Seres is at an altitude of 50 metres, near Perim-dagh (1820 metres), Drama, 105, at the foot of Boz-dagh (1854 metres). "Below the city (Drama), on every hand, trickle the waters which have been utilised by the inhabitants for dyeing and tanning." (Cousinéry, *op. cit.*, II, p. 6.)

Of the series of basins joined together by the Arno, that of Lucca deserves special mention. It does not resemble that in which Florence and Pistoia are situated, at the outlet of one of the principal passes of the Apennines. It owes its fertility to the waters from the Apuan Alps (highest peak of the Ligurian Apennines, 1946 metres). The water brought to this basin by the Serchio, like the Arno itself, meets the obstruction of Mt. Pisano (918 metres) which prevents it from reaching Pisa. Drainage has had to be combined with irrigation for the control and distribution of the mighty rush of health-bringing waters. While olive groves adorn the lower slopes, and forests of chestnut those above 560 metres in altitude, the wide plain below is a mosaic of little rectangular fields. Here the vine is garlanded in groves of mulberry and maple, which, with poplars and willows, form a screen for the protection of luxuriant crops of cereals and vegetables. This basin furnishes the food-supply of one of the densest populations in Italy.[29] The beneficent action of water is there seen at its best. Lowland crops are combined with those of the slopes. The entire range of products possible at that latitude is cultivated. And even though citrus plants, which grow no farther north than the fortieth parallel, are wanting, the chestnut, on the other hand, is not a source of food-supply in southern Italy. The cup

[29] Provinces of Lucca, 242 inhabitants per square kilometre (Italy, 126). Many emigrants leave this place temporarily for Corsica.

runneth over. This corner of Tuscany deserves to be considered as a type.

The Campania does not consist of Naples only and its suburbs, nor of the vineyards which surround Vesuvius. The essential geographical feature is the inner border of the arc of calcareous chains abruptly terminating at the edge of the plain. Peoples and towns crowd close to their foot, — from Capua, near the mouth of the Volturno, by way of Caserta, Maddaloni, Nola, Sarno, Nocera, to the calcareous spur separating this natural group from that of Salerno.

Mt. Vulture forms a kind of oasis within the solitudes of Basilicata, and more than 500 inhabitants per square kilometre crowd upon the western flanks of the Aspromonte. Upon the slopes of Mt. Etna at a level where springs are most common, there is one of the most extraordinary hives of population in the world, with an average of 359 inhabitants per square kilometre for the entire mountain periphery, reaching as high a figure as 600 on the east and south. The same holds true in the Peloponnesus, where Kalamata, the modern Messenia, at the foot of Mount Taygetus (2400 metres) has a density of population double that of the mean for the kingdom as a whole.[30]

Mt. Canigou (2785 metres) supplies the Vega of Prades and the Rivieral of the plain of Roussillon with so great an abundance of water that since the

[30] Density of Messenia, 76 inhabitants per square kilometre; mean density of Greece, 41.

tenth century, which marked the culmination of the destructive warfare between Franks and Arabs, the density of population has continued to show a steady increase. The Genil, descending from the Sierra Nevada (Cerro de Mulhacen, 3481 metres), supports a community known to antiquity by the name of the Iliberri, later as Grenada. In this southern part of the Mediterranean region, the upper limit of tree-culture rises to higher and higher levels. Citrus plants reach an altitude of 700 metres in the basin of Grenada.

The average altitude of the favourite zone of occupation around the Mediterranean, should be somewhere between 200 and 400 metres, — in other words, above the exhalations which often make the plain injurious to health, and yet not too high to prevent the cultivation of most of the crops which constitute the wealth of the Mediterranean climatic province. At this altitude, for instance, is situated the series of *castelli romani* around the Roman campagna, and the ancient *oppida* bordering the unfrequented fringe of the Pontine marshes upon the slopes of the Volscians, and the age-old cities commanding the almost deserted approaches to ancient Etruria. At about this altitude a great number of basins, forming so many demographical units, are enclosed within the sinuous folds of the Apennines. The rivers which join them together erode their outlets with difficulty, and more than once it has been necessary to aid evacuation by artificial means. The

Arno and the Tiber, like the Aterno and the Pescara on the Adriatic slope, flow through a succession of basins, that of Arezzo (272 metres) and those of Foligno, Rieti, Aquila, Sulmona.[31] Life there is healthful and vigourous. Vasari attributed some of the genius of Michael-Angelo to the brisk air of Arezzo. Round about Foligno, Assisi, Rieti and Sulmona are the highest chains of the calcareous Apennines, whose slopes are as arid as the meadows at their foot are full of living waters: Vettore, 2477 metres; Gran Sasso, 2914 metres; Velino, 2487 metres; Majella, 2795 metres. Gardens fill the foreground, grey mountains the background. The *oppida*, old fortified enclosures, found a foothold on the parts of the mountain spurs which are not cultivable. Urban life is not indigenous there. Instead, there is a rather puissant cantonal life, held together by the decree of Rome, but already affiliated by similarity of language. In this crisp, pure air, there is both preserved and constantly replenished a race of men which formerly furnished this same Rome with the best of its legionaries, and today, the labour-supply for cultivating the campagna.[32]

[31] The basin of Foligno, 310 square kilometres, 240 metres in altitude; basin of Rieti, 88 sq. kil., 400 m.; basin of Aquila, 100 sq. kil., 700 m.; basin of Sulmona, 107 sq. kil., 400 m.; basin of Lake Fucino, 842 sq. kil., 655 m. Note the small area of these basins whose populations periodically overflow. — See Maurice Besnier, *La conque de Sulmona* (*Annales de Géographie*, XIII, 1904, pp. 348–360; phot., pl. 11).

[32] This type of basin-series is not peculiar to Italy. It exists

This rhythmic interchange is characteristic of Mediterranean life.

VI. ARAB INFLUENCES

Mediterranean countries have changed in appearance with the passage of time, distribution of population likewise. A new dash of colour was added to the map of population-density when, after the depopulation which had marked the decadence of the Roman Empire, Arab rule was established in southern Italy and in Spain. With it came new crops, — cotton, sugar-cane, rice, citrus-plants, — products of tropical regions grown with the aid of a more advanced type of irrigation. The Mediterranean region, in its southern half, was a land of heart's desire. It has milder winters, followed, it is true, by longer droughts; but if sufficient quantities of water for irrigation are available, the miracles of tropical nature can be wrought. On a small piece of ground a continuous series of different kinds of crops can be raised, thereby making a powerful appeal to settlers. The achievements of the Arabs which have survived their actual occupation, like those of earlier Phoenicians, have added an exotic touch to the whole Mediterranean region. In its original state, it was to the orientals a land of forests and pastures, whereas

in France: Conflent de Prades (Prades, 345 metres) and Cerdagne at a higher level; and in Spain: basin of Urgel; Lorca (350 m.) and Murcia; Vega de Grenada (700 m.) and Campo regadio de Jaën, etc.

now orchards and gardens predominate, for whose luxuriance the painstaking methods perfected by Persians and Arabs are responsible. This does not mean that the development of irrigation had awaited the Arabs in order to become a habitual concern of Mediterranean peoples. Did not Plato allude to ancient and excellent laws relating to this vital question? [33] References to ancient treaties and agreements between peoples have been preserved in Greece. There is no doubt that an organisation existed in Roussillon in the time of the Visigoths.[34] But in any event, the Arabs should not be denied the credit of having taken more vigorous hold of the problem of irrigation than their predecessors. In the first place, Sicily afforded them a wonderful field for experiment. There was a rush of settlers. The prosperity of the Val di Mazara in the tenth century attracted a population which at that time had undoubtedly no equal in Europe. Such a centre of prosperity and of activity drew immigrants from Liguria and from northern Italy; the *Conca d'Oro* of Palermo had a population which seems to have been fully as large as that of the present time.[35] We should be particularly grateful

[33] Laws, VIII, p. 844: *τῶν ὑδάτων πέρι γεωργοῖσι παλαιοὶ καὶ καλοὶ νόμοι.*

[34] Brutails, *op. cit.*, p. 5, *et seq.*

[35] M. Amari (*Storia dei Musulmani di Sicilia*, II, Firenze, 1858, p. 435), estimates by names having Arab and Berber derivation the new centres of population established by colonists of this nationality during the Mohammedan epoch; he discovers three hundred and twenty-eight of them, two hundred and nine

to this organisation since it is responsible for the meticulous Maltese who, with the Mahonians, are transforming into gardens the outlying districts of our Algerian cities today.

The *vegas* and *huertas* of Spain were organised after the Sicilian manner.[36] Have they diminished in area? Possibly, in certain places. They are scattered, as is well known, along the eastern and southern coasts, from Valencia to Malaga, and, at some distance from the coast, between Lorca and Grenada. They must take advantage of the gorges through which streams, emerging from the mountains near the coast, have still a sufficient gradient to permit control of their run-off. M. Jean Brunhes has made an accurate and well-documented analysis of them, to which the reader [37] is referred. But let us not forget that more than 300,000 inhabitants occupy an area of hardly a thousand square kilometres, all of which can be seen from the top of the tower of the cathedral of Valencia. The clustering *bourgs* near Tarragona

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of which are in the Val di Mazara. Concerning emigrants from Liguria and Lombardy in the eleventh and twelfth centuries, see Vol. III, 1868, p. 222, *et seq.*

[36] Amari (*op. cit.*, II, p. 447) mentions the *Livre d'agriculture*, written toward the beginning of the twelfth century by Ibn el-Awan of Seville (French translation, Paris, 1864–1867). He tells us that the approved method of planting garden produce such as onions, melons, etc., was called *à la sicilienne.*

[37] Jean Brunhes, *Etude de géographie humaine; l'Irrigation, ses conditions géographiques, ses modes et son organisation dans la Péninsule ibérique et dans l'Afrique du Nord*, Paris, 1902.

and Sagunto are here spread out into multitudes of *barracas*, all exactly alike. Crops of alfalfa, beans, even peanuts, cover the entire surface. Orange groves sometimes freeze here, but not often. The *tribunal de aguas*, every Thursday morning, distributes the water among the multitudes of small landholders, who, with the aid of artificial fertilizer, are practising intensive agriculture. It is a type of human agglomeration equalled only in the industrial regions of central Europe.

CHAPTER VI

CONCLUSIONS: RESULTS AND INFERENCES

Toward the last third of the nineteenth century distribution of population entered upon a new phase, a subject far too complex to be examined off-hand. Nearly four centuries had elapsed since the discovery of America. During that interval barely nine or ten million Europeans had gone to America, — in other words, about the number at present emigrating in twenty years to the United States alone. At that rate, the prairies of North America and the Pampa of Argentina were in danger of long remaining in the same stage of development as in the time of Columbus. The causes of such a radical change cannot be summed up in a few sentences.

But from what has been said it is apparent how close a relationship exists between density of population and modes of life. It is not enough to say in a general way that each mode of life has its own space requirements which are larger for the hunter or shepherd than for the agriculturist, — though this question is still a live issue today and fully as urgent as ever in the American West, in Australia and on the borders of the Tell and of the

Sahara. As a matter of fact, every special occupation, every slightest difference in modes of living, all progress and every change in economic relationships between nations have their effect on population. Maltese and Mahonians leave their islands to go to the city suburbs in Algeria as truck-gardeners and horticulturists. Live stock raising on level plateaus which can be crossed freely in every direction, explains the increase in Boer population. The French-Canadians thrive and multiply along the banks of the St. Lawrence, particularly expert as they are in clearing forests. But look at the other side of the picture; a succession of poor harvests added to a wretched system of landholding caused Ireland to lose about half its population in twenty years. The results of such a constant interplay of social and geographical agencies are far more complex and disturbing than would ordinarily be supposed. One risks being very much mistaken when one bases his predictions as to the future on present conditions. The continuance of the present status is dependent upon phenomena to which it is related. But there are enough examples of the fact that a given race may be either prolific or sterile, depending on time and place, to prove that ethnic causes are not as important as they are sometimes thought to be. It is particularly true with regard to population, that geographical causes act upon man only through the medium of social phenomena, — one explanation of the ebb and flow which has occurred in the past. In

the future, sudden spurts of growth in population will doubtless follow periods of rest, — a somewhat disconcerting fact at best, look at it how we may.

Surplus population, an inherent and so to speak congenital characteristic of the human race, has an essentially double character, economic as well as geographical: economic, because its most frequent cause is inability to make the most of the soil, as well as the use of not sufficiently intensive agricultural methods; and geographical, inasmuch as the forms it takes and the effects it produces are dependent on the environments in which it occurs. Quite naturally, the smaller the space the earlier is the point of saturation reached. That is why islands, peninsulas, narrow strips of territory bordered by mountains, overburdened with excess population, dispose of the surplus by emigration. Owing to this fact, some of them have played an important part in the advance of civilisation. Thanks to Phoenicia, Greece and the islands of the Aegean and Ionian seas, the Mediterranean became what it still remains in world history, a centre for the gathering and fusion of peoples. Again, in the colonisation of the Japanese archipelago, the two southern islands, — communicating with the principal island as they do by an inland sea whose coast-line is even more indented than that of the Mediterranean, — played an all-important part. In Kiu-shiu and Sikok as well as on the shores facing them, the densest populations of the empire are crowded together.

But regions as restricted as these would be powerless to give to human societies the stability which would insure them against risk of destruction. Is not the Mediterranean basin, — still an imperfect picture of what it was, in spite of efforts to restore it in such a way as to make it live again, — an example of the ephemeral quality of civilisations lacking a broad territorial foundation? And the formation of great agglomerations such as we have tried to describe and whose numerical strength is sufficiently large to withstand the ravages of plagues, wars, epidemics or famines, constitutes, in our opinion, the most effective machine which humanity has thus far succeeded in contriving. Their serried cohorts can be drawn upon, without fear of impoverishment, by an area encircling them like a halo. The flood of Chinese colonists, advancing from north to south, replenishing its losses when necessary and recovering lost ground, when it reached the mountainous southern provinces finally divided, dwindling into thinner and thinner streams. But so far from its vitality of expansion being exhausted, the Chinese element in Indo-China and Malaysia is at present the most active leaven at work within the societies which it has permeated. India likewise sends labourers to Assam and Burmah, and to East Africa. Perhaps from these two great groups may come the additional population so much needed in most tropical countries.

Europe was a source of supply within herself

before being drawn upon by the New World. During the Middle Ages colonists from the already populous countries of Flanders and the Netherlands settled not only in Brandenburg, — which in that way got the name of Fleming, — but even went as far as the eastern borders of Germany. Later on, Russia took its turn at drawing from central Europe quotas of settlers for recolonising the Ukraine, its steppe-frontier.

Great agglomerations have served the cause of progress in a way all their own, because nothing new can be created without sufficient reserves of man-power behind it. Such multitudes as they could furnish were needed for the construction of the great public works which were the pride of certain Chinese dynasties; as well as for that of the dams and the innumerable tanks which are the marvel of southern India. And, — a little nearer home, — the industrial evolution of modern Europe had the good fortune, by reason of dense populations, to have at its disposal the necessary labour-supply and personnel. In the high, barren districts of Saxony, Silesia, the Black Forest, the Vosges, and Lyonnais, there were dense populations for whom industry was an avocation before becoming a vocation. The factories established in central and western England toward the end of the eighteenth century recruited their labourers from the class of small farmers who were being ruined by an economic crisis. Likewise in Japan at the present time the recently built factories are

manned by the surplus population of the country districts.

But causes which seem to be most permanent may have served their purpose. It may be that others are taking their place in the busy welter of economic phenomena. The increasing amount of necessities and the multiplicity of services required by our modern civilisation, demand an even more extensive cooperation of human resources. But transportation facilities today enable the labourer to migrate without settling permanently anywhere, to follow the demand for his services, even at great distances. But, who can say that power is synonymous with numbers? As mechanical invention develops, intelligence takes the place of man-power. What will finally happen if other sources of energy replace those dependent on clumsy machinery?

Thus an examination of the facts, as is often the case, raises more questions than it answers.

PART II

ELEMENTS OF CIVILISATION

CHAPTER I

THE GROUP AND ITS ENVIRONMENT

I. POTENCY OF THE ENVIRONMENT

As population increased new contacts with the soil were established. A larger and larger number of groups felt obliged to settle, to take root within a more or less definite area. Though this decision may have been voluntary, perhaps, and spontaneous in the case of some, it was compulsory for others, — the result of having been driven back into less desirable regions. It is difficult to imagine that any human societies deliberately chose to adapt their modes of life either to the climate of the Sahara or to that of the circumpolar regions, so that today they are completely identified with such places. Gradually, it would appear, and after a series of events of which history records but the faint, final echoes, the thousands and later millions of men who had to divide the space not preëmpted by water and frozen or arid deserts, began to assemble. Occupation became more intensive. The inhabitants were obliged to put themselves into complete harmony with their surroundings, — to saturate themselves, as it were, with the environment.

The same concept persistently forces itself upon the mind as the intimate interdependence between inanimate objects and living beings is revealed with

increasing clearness, whether it is referred to as "milieu," dear to the disciples of Taine, or "environment," frequently used in England, or even "oecology," a term introduced by Haeckel into the phraseology of natural science, — all of which in the end amount to the same thing. Mankind is a link in this chain. In his relations with his surroundings he is at once both active and passive, and it is not easy to determine in most instances to what extent he is the one or the other. Many true and penetrating things have been said in regard to influence of location and climate as well as the importance of the inorganic world; and the subject is certainly far from being exhausted. Although man, inadequately protected as he is from weather and inanimate forces, is, even so, more or less independent of the world of nature, it must not be forgotten that other living creatures have also been subject to the effects of climate as well as he. Therefore they influence him as by reflection, so that through others, he is indirectly subjected to these effects in amplified form, and with increasing complexity, from every direction. Man's activity influences not individuals, but groups, which have rights no less than he to be regarded as expressions of the environment. And so the conception of environment, which was formerly summed up in a far too simple formula, becomes more and more intricate as our knowledge of the living world increases. But the very complexity permits a tighter grasp upon it.

From the geographical point of view, one fact is fundamental, cohabitation, — by which is meant use in common of a given area. In regions where human groups have become adjusted, they have found themselves in the presence of other beings, both animals and plants, also living in groups and in mutual relationships. The causes of such groupings have been various; they depend at least as much on chance as on special affinities. Climatic disturbances have influenced and hampered plant-distribution in many ways. The ups and downs in their struggle for existence have modified the distribution of animals in every conceivable manner; and among men, in particular, the struggle for space still continues to produce disturbing effects. Most living groups have been formed in colonies or swarms rather than by the even play of natural expansion. Many of the individuals composing such groups have brought into the regions where they are held together qualities or habits contracted elsewhere.

But lacking innate affinities, the geographical bond which unites these individuals is strong enough to make them cohere, even to make of them a unit, by virtue of their dependence on one another. Our part is merely to watch this effort toward adaptation to a given space as it operates, — a cleft in the rocks, provided a little dust has settled there, is carpeted with moss, and soon a variety of plants take root, chance seeds borne by the wind. And it is not long before a world of buzzing insects is swarming about

the plants. Such, in brief, is a symbolic picture of the settlements under consideration.

This interdependence of all the inhabitants of a given area, — of all the boarders at the same table, whether friends or foes, hunters or hunted, — depends upon the conditions under which each organism functions, consequently upon climate. A study of the physiology of living creatures, other than man, enables us to discover the secret of their relationships. True, that science dates from but yesterday. The formidable rôle of carrier seems to have devolved principally upon tiny representatives of the animal world such as insects and rats, and these give a clue to connexions and relationships. The different species of Glossinae, carriers of *tripanosomes*, — living laboratories in which mature the pathogenic germs which infest vast regions in Africa and elsewhere, — are beginning to be understood as to their environmental requirements, and even as to the functioning of their secretions. And like the vegetable forms with which they are associated, both are, in different degrees, functions of temperature and humidity.[1] There is no longer a question of vague and arbitrary plagues, but of localised individuals, strictly subject to climatic conditions even in their periodical migrations.

In an environment determined by climate every living group supplies its own needs and pursues its

[1] See *E. Roubaud, Les mouches tsétsés en Afrique occidentale française* (*Annales de Géographie*, XXII, 1913, pp. 427–450).

own ends; and these various activities affect our own. Man appears in the guise of co-worker as well as of master. Along with plants and animals introduced by him, many others creep in without his permission, and work toward ends other than those he prescribes. He himself unwittingly serves ends which he has never even thought of. Walking across a stubble-field you have happened to stir up clouds of insects. You would see, if you turned, that birds are watching your steps, — for you served to beat up their game!

A dim and disquieting sense of the enveloping power of the inanimate as well as of the animate world formerly haunted the imagination, as shown in mythologies, proverbs, legends and superstitious practices throughout the world. Today it seems as if this feeling were disappearing, — judging by the quantities of exotic objects which form part of our daily life, — or at least that it has ceased to be specific. The man of today has eyes only for himself busy in the exercise of his powers. Yet many things ought to warn us of the ever-active effects of all these collective influences upon ourselves. Never has there been better opportunity than now to observe the transplanting of human groups into different environments. Colonisation and immigration are revealing countries, not new as is mistakenly thought, but differently organised, under the influence of other physical conditions. Newcomers have succeeded in establishing themselves in such places only after a process of more or less slow and difficult ad-

justment. When this transition has been accomplished and new habits formed, which, after a generation or two become fixed, we find ourselves face to face with new human types. Slips from the parent trunk have become modified in a different atmosphere. The example of the New England Yankee is often cited, but in the Appalachians there are other groups, more isolated and less well known, which have also deviated from the parent type, though in other directions. The Boers are the most striking example of what a group, having left Holland for the dry air of the African plateaus, can become in two centuries' time. And in the high valleys of southern Brazil, far from any cities, new racial types are in process of formation. In a survey of modern civilisation ancient conceptions which have come down to us through the ages as to the influence and potency of environment, further intensified by habit, should not be forgotten.

II. ADAPTATION OF PLANTS AND ANIMALS TO ENVIRONMENT

This potency of the environment results in living beings endeavoring to adapt themselves to it by whatever means are at their disposal. Our planet is so constituted that its inhabitants must accommodate themselves to constant fluctuations of temperature and humidity. The imagination of a Wells would doubtless enjoy describing the problematical existence of the inhabitants of a planet whose axis was so in-

clined that diurnal and seasonal variations would be avoided. But unexpected temperatures or drought, as well as sudden waves of heat or cold are constantly testing our endurance, — so much so, that a change of wind, a blast of *sirocco* or *khamsin*, or, as is said in Sardinia, of *levante maladetto*, is enough of a shock to upset temporarily the entire constitution.

In order to cope with such disturbances, constant effort and adjustment would be necessary were it not that through adaptation we have become accustomed to them, so that their effect is less noticeable. Adaptation results in an economy of effort which, once attained, assures to every individual, at minimum cost, the quiet regular exercise of its functions. Unless so adjusted, the organism is out of harmony and consequently tries its best to reach such a state. It has been shown by experiment that plants transferred from plains to mountains are capable in a very few years of modifying their external organs so that they are in harmony with their new habitat. This provisional adjustment, however interesting, should not be mistaken for a definitive adaptation; a long inheritance is doubtless necessary in order to insure the regular transmission of characters acquired by mere chance. But what is clear with regard to organisms is their extreme sensitiveness to any change of environment. A change of altitude has the immediate effect of releasing a spring whose mysterious mechanism affects the organs of communication and exchange with the external world.

Riveted to the soil, compelled to live and feed itself where it is, a plant has but limited powers of resistance. They are all the more characteristic on that account. Adaptations take place in tissue, foliage, stature and the development of organs both above and below ground. Smaller leaves, hairiness, coriaceous surfaces, growth of storage organs, arrangement of branches, sometimes clustering in a ball-shaped mass, sometimes spreading like a parasol, — all represent just so many different varieties of protection against drought, frost, sharp winds, and all the mordant effects of the enveloping atmosphere. Such adjustments are not without analogy in the animal kingdom. With countless examples from which to draw, one needs but to recall the *pashm* or under coat of downy wool of the Kashmir goat, the thick hair of the yak, the fur of the Manchurian tiger, — instances of a kind of protection which becomes, as it were, the universal livery of animals within the arctic circles.

But since animals, on account of their powers of locomotion, have a superiority which gives them greater freedom, enabling them to escape from the tenacious clutch of the environment, their efforts toward adaptation have been confined largely to the organs of locomotion. As if in response to a special stimulus, the entire force of what is called animal instinct has been exerted in this direction. To mention only the great animal species which share with man the land-surfaces of the globe, they are classi-

fied as runners or climbers, inhabiting regions which are sharply differentiated throughout the entire world of nature, cleared-land and forest-land. Adaptation to relief and soil is no less marked. The *Equidae* are enabled by a powerful though elastic croup to cover great distances with astonishing speed. The yak owes his imperturbable aplomb to breadth of shoulders, — flying buttresses as it were, supported on piers. Springing from rock to rock, mouflon and chamois perform their acrobatic feats by means of hard little hoofs attached to their sinewy legs, while the camel spreads his large, soft foot over the sand and the elephant gathers the weight of his huge body toward the fore, to beat out his path through the lush vegetation of boggy pools.

How do such examples apply to man? It is obvious at the outset that because of his organs of respiration, nutrition and secretion he, like animals, is steeped in influences of the environment. Is not medical experimentation founded on precisely such physiological analogies? Even if, in their reaction against the pressure of environment, human defense mechanisms may in certain respects differ, the principle underlying their adjustment does nevertheless resemble that of animals. For them both it is a question of cultivating any special superiority, of making the most of any advantage peculiar to themselves. Help is sought by animals from what chiefly distinguishes them, their power of locomotion, while man also depends upon what chiefly distinguishes

him, namely, his mind. His effort has been directed toward new and ingenious devices which might give him an advantage, — in a word, toward whatever had the charm of a new invention, — and he has found in this effort the same pleasure felt by the animals best equipped for running or for attack in the practice of their agility or in a trial of their strength. With arms to grasp and fingers to fashion materials he has made implements. Unlike the lilies which do not spin, he has himself provided for the protection of his body. Speed is attained by making use of animals and from the energy stored in matter. There is an inherent element of progress in all struggles which result from the compulsion of environmental necessity.

III. MAN'S ADAPTATION TO ENVIRONMENT

In the naïve conceptions of the ancients one particular race was supposed to inhabit each principal terrestrial zone; and if by chance facts contrary to theory unexpectedly came to light, they were explained in more or less plausible fashion. The Romans, for instance, in their intercourse with the North, having heard rumours of dark-skinned men, their wise men hastened to infer that Indians had been shipwrecked in those regions.[2]

Such ideas have been shown to be false. But it is none the less true that very remarkable cases of

[2] An anecdote recorded by Cornelius Nepos, quoted by Pomponius Mela (*De situ orbis*, . . . III, 45).

physiological adaptation appear on every hand. Dark pigmentation of the skin and activity of the secretory glands with which it is supplied, give Negroes an advantage over other races in tropical countries,—active surface evaporation, and consequent coolness, maintaining an equilibrium between the temperature of the body and that of the air. The Indian of the Amazon is far from being as well protected against his climate.

Passing from moist, warm regions to those where variations of temperature are more marked and where the dryness of the atmosphere is most extreme, other characteristic types of adaptation appear. A dry climate contracts the tissues of the skin and increases circulation of the blood. The blood, low in water-content, acts vigorously on the nervous system and stimulates it. Combined with sharp, hourly fluctuations of temperature and with rapid changes in atmospheric conditions, this dryness acts as a tonic and a stimulant. Hippocrates mentioned it in connection with the Mediterraneans. His observation applies still better to the populations of Sahara or steppes in contrast to Negroes of the Sudan. From Atlantic to Indian Ocean, from Moors of Senegal to Masai of the Nilotic regions, wherever they come in contact, the supremacy or predominance of the races living in a desert climate seems to follow as a natural consequence, based as it is on intellectual superiority.

But, on the other hand, altitude comes in as a dis-

turbing element productive of different results. At a height of 2000 metres and over, relatively dense populations inhabit the plateaus forming part of the tropical regions in the most remote parts of the world, Abyssinia and the Andes. The populations have long been acclimatised there and form, as it were, detached islets. The dryness of the atmosphere, holding bacterial fermentation in check, explains the salubrious quality of the climate which, in turn, explains why many settlements have been established above the reach of diseases prevalent at lower altitudes. Belonging to very different races, the inhabitants seem nevertheless to have acquired, because of environmental influence, one common characteristic which has become deeply rooted, — namely, aversion to effort. Equable temperature and mildness of climate are probably not the only cause. As atmospheric pressure diminishes perceptibly at high altitudes, atmospheric oxygen combines with the blood corpuscles in the lungs more slowly. According to trustworthy observations, sluggishness and dislike of any prolonged effort, muscular or otherwise, is the consequence of this slowing-down of the physiological processes which act upon the nervous system by means of the blood. How often has the lack of vitality and the look of sadness on the faces of American Indians living at high altitudes been described! The fact is noteworthy. I remember having been impressed in Mexico by the lack of life and gaiety, even among children, in the

groups which gathered at meal-times around the railway stations. Might it not be the mere effect of physical heredity.

Doubtless many other examples of similar adaptations which became constitutional and were then inherited would be forthcoming if the isolated tribes in continental interiors were more thoroughly known. When Nachtigal penetrated Tibesti, — one of the most inaccessible spots in the Sahara, — the appearance of the inhabitants recalled to him those "Ethiopian troglodytes" whose skill in running and jumping were proverbial in the time of Herodotus,[8] — a goat-people living in a rock-country. Their thin, well-proportioned bodies and delicate wrists and ankles are evidence of the immediate response of muscles to motor nerves. On the other hand, in the vicinity of the Upper Nile, Schweinfurth pictures to us tribes whose long, emaciated legs and attitude of sentinels on stilts along the water's edge, indicate no less plainly that they are inhabitants of marshes. And so, as in the animal world, such primitive human beings are differentiated chiefly by their organs of locomotion.

It is clear that those who are markedly adapted to certain special environments would be callous to those which are different. Darwin remarks that the lower a group in the scale of civilisation, the more incapable is it of acclimatisation. This observation may be widely applicable, but it by no means signi-

[8] *The History of Herodotus,* IV, 183.

fies that a similar incapacity exists among peoples well advanced in civilisation. The Abyssinian holds himself aloof from the marshes which border his natural citadel, as the Chibcha or Quichua of the Andes avoids the damp forests of the *montaña*, and as the Hova of Imerina leaves residence in the plains to the Sakalave. Likewise, but contrariwise, the Chinese and Annamese, peoples of the plain, are averse to living in the mountains, to which Lolo, Moi and other tribes have been perfectly well able to adapt themselves. The swampy zone called "*teraï*" which borders the Himalayas on the southeast, is not entirely uninhabited, but it is a region into which the Hindu never ventures, and which constitutes, between mountains and plains, one of the most marked ethnic boundaries in the world.

Altitude is the decisive factor in the above examples; it determines zones of strict segregation, and final, inexorable limits of adaptation. One would not expect mere differences of latitude to show such clear-cut distinctions. The example of the Negro is again instructive in this connexion. Those from West Africa have the mournful privilege of serving as a field of experimentation. An accident of history, which is, moreover, a geographical paradox, — not to mention being an act of lèse-humanity, — transplanted them to the United States, remote from their place of origin. Brought to the plantations many centuries ago, they find themselves today in

contact with a civilisation which, by the lure of high wages, tempts them to leave, and opens to them wide opportunities.

Life in the southern United States cannot have disagreed with them, because, in the last half-century, they have doubled in number.[4] But there are two sides to the question of increase, as shown by an analysis of recent censuses. While the Negro element is increasing in certain large cities of the north, — Philadelphia, New York, Chicago, — it continues to decrease in rural states such as Maryland, Virginia, Kentucky and Tennessee, which are on the outer margin of its domain. Shrinkage may be going on, if it is true that the Negro element north of about 35° is gradually decreasing, while on the other hand increasing south of that latitude, — between South Carolina, that is, and Louisiana. The circle occupied is contracting while density is increasing. In spite of economic counter-attractions, the influence of climate is imperceptibly drawing the Negro back toward the warm, damp regions of his natural habitat.

These facts lead to questions of pathological susceptibility and immunity, — a strange chapter, still but little explored by a science which is not within our province.

[4] 1860: 4,441,830; 1910, 9,827,763. (*Negro Pop. in the U. S.*, 1790–1915, Bureau of the Census, 1918, p. 25.)

IV. FORMATION OF COMPLEX ETHNIC GROUPS

The above groups are apparently where they belong, in their natural environment; some have even crystallised *in situ*, while others, torn from their natural environment, tend to return to it. What should one infer? Does a conception of environment imply that of a regional group with a peculiar endemic quality? The actual facts certainly do not lead to such a conclusion.

This point is not clear, either with respect to human nature, plastic as it is resourceful, or to physical nature, so diverse and delicate in its operations. Marked contrasts, with abrupt differences of climate are relatively rare; the zones blend little by little, and are transformed gradually. Are not silva, savanna, steppe, meadow, forest, — which, depending on climate, — first recognised by certain of their characteristic traits found in the midst of other types of landscape, but reminiscent of that of which they are but small samples? Such traits become more and more pronounced as the dominant type is approached, — a state of affairs highly favourable to the blending of races. As various groups tended to conquer and to occupy more and more space, nature offered no serious obstacle to the formation of intermediary groups, serving as connecting links between fundamentally different races. Just as in Pharaonic paintings where light, reddish and even jet black faces are shown side by side in neighbourly fashion, so the

picture of humanity as a whole must gradually have taken on a more and more composite appearance.

Similarity of climate provides the clew. It encourages penetration into regions similar to those left behind, in order that life may continue in accustomed ways. Abrupt transference of groups from a given environment to an entirely different one has rarely met with success; sometimes it has been followed by disaster, as evidenced by the abortive attempts with which the history of modern colonisation abounds, almost up to the present time.

If North Africa is the field where Semites, Berbers and Negroes are continually interbreeding, it is because its oases are attractive to the Negroes while to the others it offers a uniform sequence of seasons and plant-cycles, and opportunity to use the same domestic animals throughout the region. It has often been shown how almost imperceptible is the transition from Egyptian fellah to Nubian Berberine and from Berberine to Beja and Ethiopian of East Africa. Nor is this all. There are strange ethnographical resemblances between Ethiopians and Moors of West Africa, as if similar causes had produced similar results at the two extremities of the continent, and as if very analagous groups had resulted from Hamitic and Semitic blends with an admixture of Negro blood. Careful observers have described this process of hybridisation: among Berbers and Arabs the colour of the skin is first to change, that is, it deepens in colour; other character-

istics, such as straight nose, thin lips, straight hair, — also, doubtless, superior intelligence, — are more persistent.[5] One has the impression of a changing phenomenon, one in process of development.

India, though so vast in extent, is one of the areas where climate is most homogeneous; from the Punjab to Ceylon, throughout a distance of twenty-six degrees of latitude, the mean annual temperature differs by less than two degrees, — though it is true that the amount of rainfall differs greatly. This immense territory is the domain of a race midway between the Aryan tribes which came from the northwest, and the Negroids, whose scattered remnants are still to be found in the extreme south. Under the common title, "Dravidian," there is a wide range of associated types, the different grades of which can be distinguished, from the savage of the mountains of Travancore to the civilised Tamil of the plains, or from the black, thick-set Sautal of Chota Nagpur to the slender, olive-skinned Brahman of the plain of the Ganges. And it is a vigourous, deeply-rooted race. Emigration to Assam or Burmah draws from this stock, which has remained primitive in spite of interbreeding. The Khmer of Cambodia are doubtless descended from it. Numerous crosses, inevitable in so large a region, have made

[5] Gustav Nachtigal, *Sahara und Sudan*, II, Berlin, 1881, p. 436; Auguste Chevalier, *L'Afrique Centrale Française*, Paris, 1907, p. 389.

the race flexible and capable of absorbing many and varied elements.

Even more flexible, perhaps, is the ethnic combination known as the Malay race. It has spread over the world of straits and archipelagoes which extends eastward from the Asiatic continent, — in its shadow, as it were. Situated midway between the human reservoir of India and the Mongoloid races, the Melanesian type, — itself very much of a mixture, — is a blend of types sharing more or less the characteristics of all three. Toward the southeast in the vicinity of Melanesia the colour of the skin is darker, while in the Philippines, even in Celebes, some individuals might be mistaken for Japanese. In this monsoon area the sequence of races is continuous.

Doctor Hamy frequently insisted on "the extreme difficulty of making a scientific distinction between the yellow race and the white." The formation of a Siberian people will some day be sufficient commentary on this remark. The Russian people is indirect proof of it, to a certain degree. Between the Volga and the Baltic in a zone roughly following the fifty-fifth parallel, — a region of forests of deciduous trees and clearings with mellow soil which has, therefore, throughout, the same combination of building materials and agricultural lands, — Slavs and Finns are constantly interbreeding and gradually blending. One by one Mordvin, Cheremiss and other Finnish tribes are being incorporated in the Great Russian people, — in an individuality which,

the more it is reinforced by new recruits, the more dominant it becomes.

I will add to the above list of examples only one other, from the European shores of the Mediterranean. By rare good fortune the light of history there reaches far enough into the past to reveal a long chronological sequence, an unbroken series of relationships which is the clear expression of natural influences. For three thousand years a ceaseless flood has been coming from the north. One after another, Dorians and Hellenes, Rhaetians and Etruscans, Celts and Gauls, Teutons, Slavs and Normans have established themselves there. All newcomers in turn have succumbed more or less to the scorching heat of summer, to malaria, and to the many treacherous pitfalls inherent in the charm of the Mediterranean climate. But after the toll had been taken, the remainder were absorbed in the total mass, enriched in this way with new blood. And today these same Mediterraneans are settling in California, Chile and Argentina, attracted thither by similarity of climate, taking with them their individuality intact.

Over all these phenomena, unfolding before our eyes in various parts of the earth, broods the sovereign influence of environment. We can see its influence gradually increasing. But the importance of what may be called the social factor in the foregoing examples is also worthy of note, — a gregarious instinct, leading to a blend of races. It may be the result of a variety of motives; in some cases

there is a desire for a social organisation founded upon hierarchy, or rather, upon slavery; in others, the ambition, not to say the necessity, of becoming identified with a social state thought to be superior. In any event, the process of imitation, the prestige of the novel and untried, the awakening of a host of suggestions resulting from contact with or proximity to other groups, — all combine to produce a mental attitude different from that which develops in some isolated environments. Ethnic incompatibility and inherent differences cannot resist this enveloping influence, majestic and imperious as it is. They melt away, as in a crucible, and new products are the result. Such, then, is the twofold and somewhat contradictory impression gained from a comparison of the facts concerning group formation. While in certain environments groups are firmly entrenched, jealously guarding their autonomous privilege, other environments, on the contrary, stamp the societies developing within them with a certain internationalism, which is and doubtless will become more and more characteristic of mankind in the future.

V. RACES AND MODES OF LIVING

One is rather inclined to imagine that the sum-total of physical and moral characteristics distinguishing the different groups is a very complex phenomenon composed of elements belonging to a vanished past. I am not speaking merely of the anthropological problem, that of the chief divisions of the human

race whose origins are lost in a past so remote that they are entirely removed from the field of human geography. But in less remote ages it is possible to glimpse conditions capable of effects which can no longer be produced today. When there were but scattering groups here and there, narrowly limited in their relationships and contacts, how much more intensive was the concentration of racial characteristics! The severe demands of daily life enabling only the individuals most perfectly adapted to the environment to survive, tended to eliminate differences within the groups. Like savages of the present day, men of those early times adapted themselves with difficulty to any change whatever, and lived for themselves alone. "Somatological characteristics" which constitute what is properly called a race, could acquire, thanks to the relative isolation, a fibre tough enough to insure their survival. There are reasons for thinking that we cannot altogether judge those ancient times by our own. Certain results were achieved in that remote past, linked nevertheless directly to the present, which it would be difficult if not impossible to reproduce under actual conditions. Does it not seem, for instance, as if the domestication of animals, accomplished in the early dawn of the chief civilisations, must be obsolete today, an art which has expired, so to speak, and is incompatible with the actual relationships of men and animals? There has crept in an incurable distrust, which has without doubt destroyed the primitive intimacy be-

tween them. When we try to understand the very complex phenomena requiring analysis, we must take account of conditions which no longer exist, but whose effects persist throughout all the changes of millennial time.

On the other hand, with regard to social groups, the types which become dominant in the march of progress and continue to develop are those which originally resulted from the collaboration of nature and man, and gradually became more and more emancipated from the direct influence of environment. Man has devised certain modes of living. With the help of materials and substances which nature supplied, he has succeeded, little by little, — handing down methods and inventions from generation to generation, — in building up a systematic régime for stabilising his existence, one which moulds the environment to his liking. Hunter, fisherman or farmer, he may choose his occupation, thanks to an outfit of tools which are his own invention, his personal conquest, as it were, a creature of his own brain, his addition to creation. Even in those modes of living which do not advance beyond a rather humble stage of development, the inventive faculty is sufficiently active to show how versatile it is.

The degree to which a group possesses this trait is a new basis of differentiation, for the mode of living, by means of the food and clothing which it prescribes, is, in turn, a cause which modifies and moulds the human being. The Eskimo, — seal-hunter, oil-fed,

consequently with adipose layers of skin well padded against the cold, — does not in the least resemble the Tungus and Yakut hunter, nor the Lapp shepherd, who share with him the arctic zone. Although all under the influence of the same climates, the Bedouin is physically different from the fellah, the Sart from the Kirghiz; and even within the almost uniform equatorial zone, the tribes of paddlers navigating the Ubangi or the Congo, Sanga, Bayandzi, etc., differ in chest development as well as in mentality from those whose domestic habits hermetically seal them within their agricultural villages.

And yet, whatever the influence of modes of living, there is something more to be considered. Certain racial traits, remote in origin, distinct from those which actual conditions can explain, not only survive, but persist with peculiar tenacity. In spite of the mixture of races which makes a homogeneous group of any size extremely rare, — even in inner Africa, — certain deeply rooted racial characteristics inherited through aeons of descent, surge to the surface with the force of a ground swell. Their inherent, stored-up energy is concentrated in certain individuals who dominate others for good or evil, or, as is more often the case, the various forces for good and evil within ourselves struggle and fight with one another.

The essential racial quality of some groups is more vital than that of others: it brands them with some striking characteristic which distinguishes them from

others, and which is a force to be utilised. This persistence of racial traits is all the more remarkable because so many causes conspire to break them down, to submerge them in the composite character of the group, — whether language, religion, political forms or city-life. Linguistic groups include so many heterogeneous elements! States are creatures of history, with attendant risks. For a religion such as Islam, outsiders do not exist. The great city is a great leveller. And yet, notwithstanding, the ethnic germ which was thought to be dead sometimes comes to life. Cross-breeding has not succeeded in killing it altogether. Those peculiarities which were implanted in us during remote antiquity are protesting against a tendency to dead-level uniformity, which, if it were to prevail, would be, after all, a rather dismal conclusion to the progress of human relations.

CHAPTER II

TOOLS AND RAW MATERIALS

I. IMPORTANCE OF THE STUDY OF ETHNOGRAPHICAL MUSEUMS

It was first of all important to make a general survey of the complex nature of the population of a given area, — all the different elements entering into the composition of the various groups and all that has been brought together by chance and held together by environmental influence. From the point of view of race there are few, if any, homogeneous groups. But, under the influence of different environments, human activity and industry have been differently oriented; different localities may have suggested new tastes, and in order to satisfy them, new tools were devised. In a word, results have been achieved which constitute just so many different independent attempts to solve, as a group, the problem of existence under the pressure of geographical influences.

These influences are materialised in the concrete objects which can be observed in any ethnographical museum of Europe or the United States, where type-objects and implements in use among different peoples have been carefully and systematically arranged,

and in sufficiently large quantity. The savants who have had charge of making these collections have taken their specimens preferably from societies which are the most individual, either because of isolation or of independent government, and often from groups most in danger of extermination. A comparison of the objects when placed side by side is very instructive. Next to the relatively rich material from Melanesia or central Africa is that which is meagre and primitive, and which is so, not because of lack of finds, but because of the poverty of the environment. In such museums a few edged shells, arrowheads or bone amulets is all that represents the Andaman Islands; a few fishing implements and a sealskin for clothing is almost the entire equipment of the Fuegians; while, at the other extremity of the same hemisphere, the Eskimo have been able to derive an infinitely richer material from a still harsher environment. In these collections certain specimens seem to belong already to the past. They suggest an extinct stage of development, one which, together with its *raison d'être*, has already partially lost all distinguishing marks which were its pride: thus have vanished the bison skins upon which the Sioux painted their hieroglyphic texts in variegated colours, the feather cloaks with which the great Polynesian chiefs adorned themselves, the shields of buffalo hide which were part of the fighting equipment of the dweller along the shores of great African lakes, and the beautiful axes of serpentine or of nephrite

from New Caledonia and New Zealand. They will be swallowed up in the past, together with the great pirogues whose richly carved bows were seen by early discoverers like Cook, Bougainville and Dumont d'Urville. The sketches left by such men are the only proofs of the existence of industries in process of extermination and of civilisations doomed to die, whose last refuge will soon be beneath the glass of museum show-cases!

But whether rich or poor, these collections do suggest societies which have lived, developed and submitted to the effects of time as well as of place. There are indications that manners and customs were formerly less primitive than at present in a region as remote as New Caledonia.

A merely superficial sense of the exotic, resulting from the gathering of material from widely scattered sources, is not the end in view. When systematically classified, it is evident that objects having the same origin are intimately related. Single, they seem merely bizarre; in a group, they have a common distinctive stamp. After comparison and analysis, the geographical import emerges little by little. Just as the appearance of the foliage and organs of a plant, or of the pelt and organs of locomotion of an animal enable a botanist or a zoölogist to tell under what major influences of climate and relief these creatures carry on their life-activities, so is it possible for a geographer, from the material given him for study, to discover under what environ-

mental conditions it developed. Do such and such types of dwellings, arms and implements belong to a region of tropical silva, of steppes, or of resinous forests? For what kind of prey, or means of sustenance were these tools invented? The materials and shape of these implements, — for hunting, capture, defence, working, warehousing and carrying, — bear witness to an origin in and a relation to certain modes of life, themselves developed under the influence of physical and biological conditions which can be determined. From such a point of view, a lesson in comparative geography inheres in evidence from the humblest societies. And as to highly developed societies, whose wealth of material could not be confined within museum show-cases, there have been preserved, for the time being at least, enough remnants of local practices and costumes to make them instructive. Emancipation from local environment is never as complete as our urban prejudice would have us believe.

II. THE STAMP OF THE EQUATORIAL SILVA

Of all the great zones of climate and of vegetation, none has a more striking oecological stamp than that of the tropical rain-forests, confined approximately to a strip between ten degrees north and south of the equator. We have mentioned the combination of causes which there explains the isolation of human groups. One would be mistaken, however, in concluding that interesting civilisations had

not developed there. The splendour of the majestic world of vegetation has not been lost, so far as human undertakings are concerned. Tall shafts of huge circumference, — pillars supporting the great forest-galleries in storeys, — furnished the timber and frame-work for building construction. Fine-grained, hard woods lent themselves to the carving of mouldings and ornaments. Various kinds of trees, — figs and others, — supplied flexible bark which could be cut in strips, and which, after being steeped and macerated, has the toughness of a fabric. From the African *Elaeis guineensis* and the *Mauritia flexuosa* of Brazil to the Polynesian coconut, this zone contains an immense variety of palms. Man utilises the leaf-fibres and the tough filaments surrounding the trunk for tools or buildings. How to fasten together the heterogeneous parts which go to make up an implement or weapon, a hut or a boat, has often been a stumbling block to primitive industry. Bolts of bone or metal or even coats of pitch or of tar have elsewhere served the purpose. Here it is vegetable fibres. They were used to bind the wooden handle to the ax of jade, the cord to the wooden bow; with them the various parts of the frame-work of a hut were fastened together, the strips of bark which formed the walls hermetically sealed, the framework of beams secured in the boat and the motive apparatus adjusted upon them. Even the peoples who understood the use of iron continued in spite of that fact to use fibres or filaments of palms

for joining and binding. No resources of the colossal vegetable world were overlooked. Palms, screw-pines, bananas, their long, broad leaves swollen with atmospheric humidity, have notwithstanding an extraordinarily compact tissue, which is by way of compensation for active evaporation. Their clusters of leaves were ready-made for the weaving of tough, flexible mats, the fashioning of impervious vessels and the making of roofs of "vegetable tiles," every whit as rain-proof as those of tile or slate.

Man has made extensive inroads upon this grandiose world of vegetation. He has isolated its component parts in order to make use of them. Its effect on human civilisations can best be observed not in the forest itself, but along the fringes and border-regions which have been separated from it. Botanists have noted in many places the unmistakable evidence of cutting which has limited the area of distribution. But plant-growth is so vigorous that woody grasses and giant reeds spring up at once, filling whatever space is left for an instant vacant by destruction of the forest. This is how bamboo, bordering this type of forest and supplanting it, has come to occupy an area whose very immensity helps to explain the variety of uses to which the plant is put. In this way it has become one of the materials useful to mankind; it adds its bit to the prolific sources of plant energy, whose lavish bounty has discouraged any activity among the forest-dwellers

themselves, but which has been immensely useful to those who live along its edges.

Tropical vegetation has not merely been of service to mankind. It has often inspired novel types of building construction. For these superposed ranks of forest galleries are structures which live, from the underbrush close to the ground, and trees of medium height, to the loftiest summits crowned and enveloped in an aery roof of foliage. However indifferent a copy the architecture of the native hut may be, it does recall the model none the less, if only remotely. The intertwined lianas which enable certain denizens of the forest to move about without touching the ground, were metamorphosed by man into bridges of plant fibre which are in common use from West Africa to Melanesia; the natives of Amazonia took them as models for hammocks, which seem to have orginated there. The big spherical fruit of the *Lagenaria* and of the coconut-palm, like ostrich eggs elsewhere, gave a round or oval shape to the bowls or calabashes which were made of them. Another type of container was the hollow cylinder between successive joints of a bamboo stem, whose capacity may be as much as two litres. The world of living nature has this peculiarity, — it suggests shapes and then proceeds to furnish the materials out of which to make them.

There is a certain family resemblance between all articles produced by tropical peoples. Similar climate and environment are sufficient explanation,

without having to assume relationships and exchanges, very unlikely when it comes to regions separated by ocean-reaches like Atlantic or Indian Oceans. The rectangular type of hut with gable is predominant from West Africa to the Congo, and from Melanesia to the Philippines, also in Amazonia. The abundance of hard woods as well as their dimensions, — for they are sufficiently large to make corner posts and girders, — have made it possible to construct buildings of some size, spacious enough to house many occupants, and suitable as places in which to meet and to dance. Such types of communal houses are found even among the remotest tribes of New Guinea. In all such places the soil is damp and sour, the abode of reptiles and enemies of every description; everywhere, or nearly everywhere, the dwelling is raised on stakes or piles above the ground, not only along the banks of streams or lakes, as in Venezuela, but upon hillsides where the Melanesian population prefers to live, or on high land chosen by the Tagal of the Philippines for village sites. The habitation must be protected from heavy rainfall by a thick, water-tight covering. With the aid of raffia-palm, banana, *ranevala*, coconut-palm and countless other equally strong, pliable species, the steep roof is covered with stems or leaves skillfully interwoven, an impermeable superstructure which envelops almost the entire hut. Sometimes extending far enough beyond the layers of plant-fibre which constitute the wall, to leave space beneath it for a ve-

randa, sometimes overlapping in such a way as to fit two superposed roofs into one another, this picturesque crown of the building gives it a characteristic aspect, which must have fired the imagination and awakened an artistic sense, because there is a suggestion of it in Chinese and Japanese architecture.

Similar materials often result in similar tools. Melanesians, Africans of Congo or Dahomey and Indians of Amazonia have carved out of highly-coloured woods, — hard enough to preserve the sharp edges and the delicate tracery of the workman's chisel, — seats, stools and taborets upon which their penchant for decoration is displayed, sometimes even to delirium. The club, which in other localities is still a coarse and clumsy weapon, has, in Guiana as well as in Polynesia, assumed an elegance and variety of form which have given it the value of an ornament and of a badge of authority. Finally, hollowing the trunks of certain trees has been all that was necessary to produce the enormous drums which, from West Africa to Melanesia, are used for summoning or signalling, elsewhere a function of horns and sea-shells.

Strips of the bark of different species of *Ficus*, of *Artocarpus* in Indonesia, and of the paper-mulberry in Oceania, after going through a process of maceration and beating, eventuate in the fabrics of which Polynesian industry furnishes us elaborate examples. To a less degree they are found in almost universal use throughout the length and breadth of the sub-

equatorial zone, from Polynesia to Indonesia, and from the Welle to the Orinoco.

No less characteristic are the uses to which are put the long tubes of woody reeds. In the forests of Amazonia, as well as in those of Borneo, Sumatra and the Malay Peninsula, these have been made into an offensive weapon, the blowgun (*Blasrohr*), in French called *sarbacane*, from which the projectile or the poisoned arrow is expelled by the breath. A weapon essentially suited to the thick forest, where the bow and arrow and the assagai would not be easy to use, it has become localised to such an extent that its present distribution has decreased in proportion to that of the forest itself. But, like bark fabrics and many other characteristic inventions whose distribution area is steadily shrinking, the blowgun is evidence of the use which these embryonic civilisations have been able to make of the plant-world in whose midst they developed. Without any direct means of intercommunication, curious similarities between objects indicate parallel development as far as adaptations from nature are concerned.

Even the use of metals stimulated native industries without changing them. It is surprising to note, especially in the interior of West Africa, to how great an extent the technique of metal-work is inspired by shapes derived from the vegetable kingdom. It seems as if iron had taken the place of wood only by virtue of imitating it. Such a variety of throwing-knives, blades and sacrificial implements has grown

up in the region between the Welle and the Kassai that they seem but a reflection of the endless variety of species within the tropical forest. Some weapons have a symmetrical outline along an axis like the median nerve of a banana leaf; others are lance-shaped like the terminal bud of a palm; others are curved and on the inner edge bristle with teeth or lamellae like the stipules which protrude from a leaf-sheath.

III. CENTRES OF ORIGIN AND GROWTH

Naturally, more complete knowledge of the tropical world has brought into relief against a common background an unexpected variety of independent developments. The interior of Africa, for example, has ceased to seem a dreary waste of uniform, unbroken savagery. On the banks of the Kassai, the Congo and the Welle, scientific travellers have found types relatively advanced in civilisation, — for instance the Bakuba, Batek, Monbuttu and others.

Ever since the time of Livingstone the essential difference between areas to the east and to the west of the great African lakes has often been pointed out. Implements, weapons and clothing of the Masai contrast with those of Congo tribes as steppe with jungle, great running animals with arboreal fauna, and shepherd with agriculturist.

Malays. Tropical vegetation is once more at the height of its glory in Malaysia and Melanesia south of the continent of Asia, a world of islands and penin-

sulas within the Asiatic shadow, as it were. An unusually rich mammalian fauna is characteristic of the luxuriant plant life of large islands such as Borneo and Sumatra, neighbours of the great continent. The unique character and wealth of ethnographical material is in keeping with the world of nature.. The Battak of the interior of Sumatra, the Semang and Sakai of the Malay Peninsula, the Dyak and Kenyah of Borneo have made, each in accordance with its own ideas, weapons, clothing and implements, typical forms as archaic in comparison with the present Malay civilisation as those of a Castilian shepherd or of a palikar would seem to us. Along streams or bays, on hillsides and within the forests of the little known interior of the small continent called New Guinea, — more than 800,000 square kilometres in extent, — long-headed Negroes with very thick wool have, without the aid of metals, made clubs, bows and drums like those of African Negroes, fetishistic masks like those of Dahomey, artistically carved stands for head-rests similar to those used in Japan, pirogues with outriggers and platforms like those characteristic of the islands of the Pacific.

These land surfaces gradually break up into smaller and smaller fragments, — into a mere dust of islands. In the time of Marco Polo sailors reported that "there were of them 12,700, all inhabited, not counting those which one knows not." Even though luxuriance of plant-life decreases along with land areas, certain general similarities still

hold. There is no real break between the Malay world and the Polynesian. A relationship exists between them, one much more apparent than that between east and west equatorial Africa. The medium of exchange and of trade in use throughout a pan-Pacific process of colonisation has doubtless much to do with it. Once again environment provides the clew.

Polynesians. An inventory of tropical products on the continents shows that the only animals of use to man are birds, particularly those of Brazil and Guiana, or the mighty denizens of marsh and savanna, — elephants in Africa, buffaloes in Asia. Marine fauna is utilised in isolated instances, but only in its minutest forms, — pearls or shell-money. It is increasingly important in Indonesia and in Melanesia, on the other hand, finally becoming predominant among the archipelagoes of the Pacific. In Borneo, New Guinea, and even in the mountains of Burma and Assam, long shields of wood are adorned and embellished with shells, in Borneo breastplates of bark are covered with fish-scales, and in New Guinea grotesque masks are plated with tortoise-shell.

Thus is heralded the approach to a maritime province, — known above all others for the variety and splendour of its fauna. Between the Indian Ocean and the tropical Pacific the realm of giant tortoise and pearl oyster meets that of the cowrie (*Cypraea moneta*), — the first specimen of the shell-money which has had such a wide distribution, — of the

nautilus, and above all of that wonder of wonders, the *Tridacna gigas*, whose equivalve shells, often as much as one metre in diameter and resembling a *bénitier* (holy water stoup) in shape, are adorned with the most vivid colours. This Indo-Pacific region whose coral structures with reefs and lagoons provide food and shelter for myriads of fishes is, in its own way, a mighty focus of life. The stamp of its marine fauna has been put upon human industries. In other words, these Oceanians, unacquainted with the use of metal, have made use of the hardness and great size of *Tridacna gigas*, which they found imbedded in the coral reefs, for the manufacture of ornaments and weapons. By persistent rubbing with a stone fastened to a piece of bamboo, they hollowed it into a receptable, or sharpened its edges. Discs, bracelets and implements with a knife-edge have resulted from their patient labour. Clubs, lances and harpoons bristle with teeth and bones of sharks and sperm-whales, the great rovers of tropical seas. In fact, the whole arsenal upon which the existence of these island-dwellers depends is fortified with such appliances, — deadly as they are picturesque.

Insular distribution is responsible for certain clearly marked endemic characteristics, — in other words, the Polynesian world is far from homogeneous. Ethnographical material, like modes of life, varies from archipelago to archipelago. Side by side with perfect specimens of the art of ship-building, there is complete ignorance of navigation. For example, the

Matty archipelago, close as it is to New Guinea, is distinguished from it by a total lack of nautical material. Again, the shapes of clubs, although made of the same materials, vary from one island to the next. Implements and accoutrements of war are highly specialised. The warrior from the Solomon Islands, with his plate of shell against his forehead, his bow of coconut-palm wood and his shield of vegetable fibre, is one of the strangest types. But even more bizarre and more formidable still is the fighter from the Gilbert Islands, armed with his club alive with sharks' teeth, protected by an armour of coconut fibre adorned with human hair, in which he hermetically seals himself in spite of the heat. He suggests some sort of a samurai or mediaeval knight gone astray in Polynesian seas! And lastly, when these various island societies were still intact, the aristocratic chief of the Maori paraded in his glory, war-club of serpentine or whale-bone hanging from his wrist, wrapped in a cloak of *Phormium tenax* in which his majesty was enfolded. To far-away New Zealand, the extreme southern boundary of Polynesian colonisation, as to the Hawaiian archipelago at the north, these island civilisations had given a certain éclat. There, as in Tonga, Samoa and Tahiti, were built the great pirogues which won the admiration of early travellers like Cook and Dumont d'Urville. When one reflects that artisans who could bind together two immense pirogues, sometimes as much as a hundred feet long, firmly enough so as to man-

euver them as one, had at their disposal no materials except wood, plant fibre and gums, and no implements except those of shell or stone, one's admiration can but increase the more.

IV. THE WORLD OF OPEN SAVANNAS

As one leaves the equatorial forest and approaches the tropics, plant life gradually loses its importance. Grassy savannas take the place of those with trees, to be in turn succeeded by steppes. As vegetation decreases the uses to which it is put diminish also. But a steppe-fauna in place of a forest-fauna means a different equipment for man. It is the animal kingdom which now becomes the guide of human industries. Countless myriads of antelopes, gazelles, ostriches, buffaloes, Ovidae, — running animals whose hair or feathers enable them to live in a great variety of environments and in harshest climates, — are living raw materials. Leather cut in strips, stretched on shields, softened into garments or containers, takes the place occupied in the moist equatorial zone by lianas, fibres, bamboo and bark. The development of African pastoral life in both hemispheres emphasises this common characteristic. Shepherds and warriors, — Masai and Galla north of the equator, Kafir and Zulu south of it, — all use animal hides for outfits and implements. Differences depend on individual taste or on local circumstances. The oblong cowhide shield of the Zulu, — the Spartans of Africa, — has dimensions commensurate with their tall stature.

The Matabele warrior wears a belt from which are suspended the skins of animals. The more peaceable Ovaherero shepherd has given particular attention to the portable outfit which his mode of life demands; he protects himself against sudden changes of temperature with a great skin cloak, the *kaross*. The monumental heads of hair of the warlike tribes of East Africa resemble a lion's mane, topped by a coronet of ostrich plumes. And a glimpse of Masai or Kavirondo warriors thus decked out recalls the Berber huntsmen north of the Sahara shown in rupestrian drawings of the neolithic period, or the Libyans pictured on Egyptian monuments of the nineteenth dynasty.

Though the fauna of New World steppes was inferior, it was none the less useful to man. In South America the guanaco furnished the Tehuelche of Patagonia with leather for making *bolas*, and after the introduction of the horse, for making harnesses for their mounts. In North America the Sioux made their tents of buffalo hides, or used the leather as foundation for the fabrics on which painted shapes related genealogies or spoke a symbolical language.

Many of these things belong to the past; there is a touch of the archaic as well as of the exotic about them. In Europe we are accustomed to associate such extreme peculiarities of costume and of style with regions which have remained isolated to an unusual degree, living their own lives. Although

decreasing daily, such can still be found in mountainous districts of Europe, around the Mediterranean and sporadically in Alps and Carpathians. The herdsman of Castile, the palikar, the Wallachian shepherd, the Tyrolese, the Uzule of the High Tatra, are almost pure types of survivals already perilously near extermination. Most frequently only certain garments remain as evidence of requirements of the local environment. As since time immemorial, the Tuareg, veiled horseman of the desert, continues to protect his face and eyes from the fine dust floating in the air with the *litham*. The shaggy *shlamyde* of sheep-skin, the Sardinian *mastruca* and the hood of the burnoose protect the shoulders from brusque changes of temperature felt at morning and evening or between sun and shade. Such garments give the final touch to the actual, living picture of well-known types shown on ancient terra-cottas. Though different in shape and both with and without embroidery, one piece of clothing is in universal use from Spain to Persia. It is the felt or leather gaiter, indispensable on account of the briers and thorny brushland which here takes the place of true forest.

V. SURVIVALS AND INDEPENDENT DEVELOPMENTS IN TEMPERATE AND FRIGID ZONES

Local peculiarities are very tenacious. In civilised countries they persist in the shapes of necessities which local industries continue to manufacture. Jars,

vases and pottery in Spain, as well as in Barbary and in Egypt, are still identical with those which came from the hands of the potters who first practiced the art of modelling in clay. The deciduous forests of central and eastern Europe provided raw materials for those skilled in shaping wood to various forms and uses. We shall see later how the arts of building and of transportation made use of tough, flexible woods. But, even today, if one wishes to get an idea of how well our forefathers understood the use of wood, one has only to look at their furniture in remote country districts, or better still, to consider the various uses to which the same woods are put by local industries in the forest governments of European Russia where, for many purposes, wood is a substitute for metal. The muzhik is a carpenter by nature, as the fellah is a potter. The deltas of Tonkin and of Amazonian Guiana are, in this respect, almost equal to the delta of the Nile.

Isolation and adherence to special modes of life will insure the preservation of local peculiarities for some time to come. In the steppes of central Asia the possessions of Kirghiz shepherds, — felt tents, leather straps, woolen cords, rugs, clothing and utensils, — all are obtained from the live stock which there constitutes wealth; and, in spite of the importation of cotton and other foreign goods, such articles keep a local flavour which strikes us as so archaic among our own mountain folk.

In British Columbia a group of tribes by the name

of Nootka, living beside the fiords and fish-stocked streams of a zone of forests, — virgin in part, — form a strange chapter, unique in American ethnography. There is preserved, almost intact, a material civilisation bearing the indelible impress of a particular environment. Wood predominates in both buildings and utensils. In the board houses, in front of which stand carved wood totem poles, pottery is unknown, and food is cooked in wooden vessels by means of red-hot stones.

In order to find societies even more markedly local in character, one must push on to the shores of arctic seas, beyond the zone of forests bordering the northern confines of Old and New Worlds. There live peoples which have been driven back by the configuration of the northern hemisphere. True, what is ironically called " civilisation " besieges and destroys them in the form of alcohol. But those people who, like the Samoyed, have been able to adapt themselves to life on the tundra, — steppes of the Far North, — escape the perils surrounding them more often than hunters and trappers. For clothes, they breed reindeer, which with the dwarf-birch, the only shrub which ventures to invade these latitudes, supply the material, skins or bark, for covering their summer tents or making their containers and other vessels.

In another type of arctic environment lives a still more specialised group, that of the Innuit or Eskimo tribes which have made themselves a home between

Alaska and Greenland. There, neither breeding reindeer nor fishing in the fiords supplies them with food, but the great sea mammals which, in summer, must be hunted in the open, and in winter, surprised at holes in the surface of the ice where they come up to breathe. For food, clothing, shelter, weapons and transportation there is nothing but the skins, tusks or bones, and oil of these animals; for building winter homes there is snow, and whatever driftwood may be left on the shore by ocean currents. What the Eskimo has been able to accomplish with such meagre resources is extraordinary. No one except this specialist in the American Arctic has been able to adapt himself to such an environment. His originality has been shielded by isolation. His crafts have been built with a combination of wood and walrus-or sealskin, his harpoons armed with teeth or tusks of those animals. Even in the bow, what is now wood was formerly a series of jointed bones. As for the technique and artistic finish of the various objects required by their mode of life, "the Eskimo," says Ratzel, "have accomplished great things." The most remarkable thing about them, — after their clothing, which successfully combats the climate, — is their means of transportation: the sled, drawn by dog-teams across the snow or carpets of moss, and particularly the kayak, a long, slender craft covered with leather, in whose orifice sits the fisherman, and which is really a part of himself, — the prolongation of his person, as it were.

CONCLUSION; STEREOTYPED CIVILISATIONS

The interest which these examples of independent civilisations arouse today is well justified. They show how modes of life have been able to crystallise spontaneously, independently of one another, and in a variety of surroundings. Forced to utilise the resources which the environment affords, unable to depend on the slender, casual support of commerce, man has concentrated his attention upon but few materials, and, by his ingenuity, has succeeded in adapting them to an extraordinary variety of uses. Such, for instance, are bamboo and coconut-palm in the tropics, date-palm or Agave in deserts, birch in sub-arctic regions, reindeer in the Far North of the Old World, seal or walrus in that of the New. So characteristic are the above animals and plants, that following the example of some botanical-geographers, certain living species might be taken as symbols for identifying certain types of civilisation.

And yet, however interesting these civilisations may be, the very fact that they are dependent on particular environments shows that they are inherently weak. They lack the power either to impart or to expand. But, if their dependence upon local environment is a limitation, in certain cases it serves only to bring into greater prominence the versatility of invention of which man is capable; because these autonomous civilisations which we are tempted to describe as rudimentary and primitive, are far from

being on the same level or on the same plane. The time is past when central Africa is thought of as a dreary, uniform, savage waste. There are, or have been, different degrees of development among such societies: some, like the Monbuttu described by Schweinfurth, had reached a rather advanced stage of culture in comparison with other groups. Between Eskimo of the American Far North and Fuegian of the Far South, is a wide gulf of difference. And yet all the peoples dependent upon their own resources alone have had to fight against a more or less merciless nature. Their success like their effort has not been equally great.

But in spite of the variety of materials supplied by nature, the methods of adaptation are more or less similar. Implements which man has manufactured for purposes of attack, defense or transportation, or for use as containers, do not greatly vary from certain standard types. Whether made of stone, gold, shell or wood, ax, club and bow have the same general shape. Dug-out made from the trunk of a tree, bark canoe, kayak covered with skin, rigging of sails of woven mats or of canvas or leather, — as among the early Celts, — differ more in material than in form. It is the purpose underlying the use of materials which is manifest, the power of invention which man shows in branding them with his own mark. Human intelligence is sufficiently uniform to seek expression in almost identical ways.

CHAPTER III

MEANS OF SUSTENANCE

The food-supply is one of the closest ties between man and his environment. Clothing and weapons of offense and defense are much more subject to modification through the influence of commerce than the diet, which experience has shown to be best suited to a given climate. Different climates require different regimens. An extraordinary diversity of foods is the result; Bedouin or fellah, Mediterranean coast-dweller, Mid-European or North-European, Chinese, Japanese or Eskimo, — each has developed, with the resources of his environment, and some others in addition, a food-supply which has become typical, distinctive, growing more and more so with habitual use. Of all the characteristics by which societies are distinguished one from another, diet is the one which most impressed early observers, witness such words as "ichthyophagous," "lotophagous," "galactophagous," a nomenclature handed down from antiquity, the ethnographical observations of Herodotus regarding the peoples of Scythia, or references to cannibals liberally dotted over maps of the sixteenth century. Even in Europe at the present time consumers of oil and butter, of wheat-bread or

of rye-bread, continue to live in inaccessible regions in spite of the levelling influence, in this regard as in every other, of city life.

This is not the place in which to discuss the geographical distribution of food-stuffs in general. Our intention is to show how, through this medium, certain environmental influences continue to be operative. And so our illustrations will be taken from localities where such influences are most interfered with, namely, from extra-tropical regions. Furthermore, the line of division is one sanctioned by nature, for it separates the province of the banana from that in which wheat and the vine mature readily, which means beyond the thirtieth parallel in both northern and southern hemispheres.

I. MEDITERRANEAN TYPE

The first example to come to mind is that of the Mediterranean basin. It has a clearly marked type of climate, in which two principal seasons, dry summer and mild winter, are connected by more or less humid transitional seasons. Furthermore, nowhere can settled habits and firmly established civilisations be traced as far back into the past. Wheat, barley and beans are found in the most ancient tombs of Egypt, while fig-tree, vine and onion appear in the most ancient paintings, — in other words, the entire range of food-plants on which the fellah lives today. And they all resulted from an already long

agricultural process of improvement, a combination of plants which formerly grew in widely scattered localities, perfected from the wild state, and of which there are now many different varieties. Egypt has been able to enrich itself by importing new industrial plants from Babylonia and from the Sudan in particular, but the menu of the native has not changed in the least. He is a vegetarian, in contrast to the shepherd whose diet consists of cheese, made of sheep's or goats' milk, and the flesh of his lambs,— a contrast clearly brought out in Homeric poems. Of the cereals which form the basis of his dietary, barley was long the favourite; sown in November and harvested in March or April, it ripens earlier than wheat, and, what is particularly advantageous in irrigated districts, it leaves free for a longer period space needed for other crops. But in Egypt, as around the entire Mediterranean, wheat has gradually taken its place. Sown immediately after the autumn rains, it takes advantage of the brief pause of winter to drive its rootlets deep down into the soil, there to become charged with nitrogen and other substances which later will be transformed by the growing stem as it comes in contact with the atmosphere, until finally, swollen by the last rains of spring, it will eventuate during the hot, dry Mediterranean summer in the full-grown spike of wheat. The cycle of plant growth corresponds exactly to that of the seasons, a maximum of favourable conditions explaining each stage of growth. The hard

wheat of the Mediterranean countries owes its eminently nutritious qualities to an abundance of gluten, and consequently remains the chief article of diet in those regions; to a modern Greek, eating bread is synonymous with eating.

Classic antiquity refers to two chief agricultural occupations, tilling and planting, — he who produces the sacred barley or wheat, and the skillful horticulturist who, by grafting or clipping, perfects the fruit of trees or shrubs whose deep-boring roots protect them from the summer drought.

The art of Triptolemus had as its complement in the minds of the ancients that other art which tradition says the skillful Phoenician horticulturists transmitted to their successors now living in Sfax and Kerkenah. To understand the food-value of these orchard-crops they must be considered in connexion with plants growing in their shade: carpets of barley, beans or wheat, adorning the flights of terraces beneath the sparse foliage of olive-trees; vines festooning the branches of ash-trees in Kabylia or of elms and maples in Italy; luxuriant garden-plots where beneath fig-, peach- and other fruit-trees, flourish the spices, salads, gourds, melons and watermelons heaping the hospitable board which delights the Mediterranean native. He finds upon it, during the scorching heat of summer, whatever is necessary to quench his thirst or to stimulate his listless appetite.

Among these trees one stands out preëminently,

one which the Bible calls monarch of them all. Perhaps such a title for the olive many surpise those who have not been able to observe for themselves the part it plays in the diet of Berber peoples. Olive-oil in North Africa and adjacent regions of the southern Mediterranean is an article of consumption much more than of export. The tree-producer, — perfected long ago by cultivation, and so well adapted to the Mediterranean climate that after living for several centuries it continues to renew itself and to send up sprouts, — slowly stores up within its fruit oily substances rich in carbon. No less than six months elapse between blossoming, which takes place in April, and ripening, which begins in November. It is by reason of this long process of elaboration that the juices which the olive-tree takes from atmosphere and soil by means of its long roots and its evergreen foliage, are concentrated in the fruit. The end-product contains fatty substances which can take the place of meat if worse comes to worst, and which indeed do replace it almost entirely in the habitual diet of the Berber. He who has seen the wheat-cakes coated with oil consumed every day by the natives of Algeria, has witnessed a striking example of one of those long-established dietary types which are handed down from century to century. Mutton, "the paschal lamb," is reserved for feast-days, when portions of meat, allotted according to the number of male inhabitants, are still distributed in Berber countries.

II. AMERICAN TYPE, MAIZE (INDIAN CORN).

In warm climates, where spring rains continue well into early summer, maize, like the tree of Minerva, is another food-plant which grateful humanity has honoured with a cult. When these rains so necessary for the growth of the plant are delayed, the Pueblo Indians living near the foot of the Rocky Mountains in Colorado form processions, whose participants hold in each hand an ear of corn to invoke the speedy arrival of the life-giving flood. Just as wheat is associated with classic European civilisation, so maize is inseparable from the development of American culture. When the Europeans landed in America they found this plant under cultivation on the Massachusetts coast as well as on the plateaus of Mexico and Peru. Kernels were discovered later in the mounds or tumuli of the Mississippi Valley. There were already many varieties characteristic of different climates, but none cultivated north of the forty-fifth parallel. To an American today as formerly, maize is " corn ", the chief cereal, like wheat to the Mediterranean. On the high plateaus of Peru it was the staple food-crop, — together with potatoes and quinoa. In Mexico it was combined with leguminous plants such as the *frijol* or black-bean, while in addition there was the equivalent of palm wine, so-called *pulque*, a fermented liquour obtained by cutting the flower-stalk of the maguey or Agave, one of

those versatile plants which supply food, drink and clothing.

Maize has long since ceased to be an exclusively American crop. But the centre of production is still the United States which supplies 90 per cent of the world production. Because of hog raising, an industry dependent upon it, it is an important item in the rural economy of the great republic, as is well known.

Maize, with wheat, rice, the vine and tea, — to mention only the principal plants used for human consumption, — is consequently one of the staples of trade which have served as vehicles of civilisation. Its cultivation began in America, possibly among the Chibcha of Colombia, and from there it has spread into southern Europe, Africa and even as far as North China. As our gratitude goes out to those who first gathered wheat from the clumps of wild cereals in the valleys of western Asia, or to those who first cultivated rice in the pools left by the periodic river floods of monsoonal Asia, so it should go out to the American aborigines who learned how to select, to preserve and to produce varieties of a plant whose heavy kernels, difficult to disseminate, might otherwise have caused its rapid disappearance. The gift of this food-crop, which has had a remarkable social significance wherever it has been accepted, is no mean legacy from those so-called primitive societies. Its rapid growth helped perhaps to discourage settled habits among the natives. But it contributed toward

the colonisation of America, because, — being easily cultivated by hand and without the aid of a plough, quickly producing kernels which are edible even in the milk-stage, at the end of seven or eight weeks, — it became, whether in the form of kernels, flour, or roasting grain, the viaticum of explorers and pioneers. Later maize was the guardian angel of the small farmer, defraying, by its rapid growth, the initial cost of settling. When introduced into Europe there was room between its widely spaced hills for other crops such as gourds, beans, tomatoes and sunflowers, and almost everywhere, from Aquitaine to Lombard Brianza and to Wallachian Oltenitza, it has lightened the burden of the small proprietor living upon his own land by the sweat of his brow. With a lower gluten content than that of wheat, but rich in carbohydrates, — useful for fattening, — and in glucose, maize-flour has under different names (*tortilla*, *polenta*, *mamaliga*) become part of the daily diet of rural classes in large sections of southern Europe.

III. CENTRAL EUROPEAN TYPE

While maize is staple in America, in Europe it is only accessory to an already ample diet. For a long time a distinction has been made between consumers of oil and wheat in the South, and the populations just north of the Mediterranean region. In Celtic and Danubian Middle Europe, north of the forty-

fifth parallel, there was a variety of means of sustenance based on certain rural practises. There is archeological if not historical evidence to prove this fact. As long ago as the sixth and fifth centuries before Christ, with the help of finds dating from La Tène and Hallstattian civilisations and from the débris of lacustrine sites, a series of food provinces can be detected, — independent provinces, it is true, rather than a federation, but vying with one another for a share in the sunny climate which generously supplies vegetation with at least six months of favourable temperature and rainfall. Here the country was divided by nature between open spaces dotted with trees, and forests in which deciduous trees predominated. Such was the setting of rural populations, the one in which their habits were formed.

Ancient historians, — Polybius, Strabo, Pliny and even Herodotus, — all agree as to the abundant food-supply and dense population. The teeming multitudes in central Europe which are cause for amazement to the Mediterraneans, perhaps for fear, are not an affair of yesterday. But this region is different from those of more ancient civilisation. The economic state is less unified, more tinged with provincialism than that upon Mediterranean shores. Each of these ancient peoples, — Gauls, Germans, Illyrians, Dacians, Thracians, Sarmatians, — had its own customary foods and drinks: various kinds of millet, for instance, especially in eastern Europe and among Slavs, rye or spelt among Germans, millet

and rye as well as wheat among the lake dwellers of central Europe. Beverages were made of the same ingredients, — *cervoise*, wheat beer, hydromel, perhaps, also, the Wallachian *tsuica*, a liquor made of plums. Certain special crops like spelt still survive, though barely so, in some cantons of German Switzerland or Swabia. But although wheat and the vine, with their convoy of fruit-trees from the Orient, have become prevalent, in fact predominant, as staples, the dietary habits established in central Europe, after having been somewhat modified long ago during the Roman conquest, are only today beginning to yield to the influences of urban life.

The combination of conditions of soil and climate which has favoured this remarkable development is found in Europe roughly between the forty-fifth and fifty-fifth parallels, that is, between Aquitaine and northern England, Lombardy and southern Scandinavia, the Balkan peninsula and the vicinity of Moscow. Farther south both intense summer heat and lack of humus are detrimental, whereas farther north the crops are frequently endangered by frost and handicapped by a short growing season. But between those two latitudes is a wide zone whose possibilities have been extensively utilised by mankind.

The term "parklands" which is sometimes used to describe this section of Europe, applies to a primitive condition rather than to a present state; because the crops and trees which contribute to our food-supply have been systematically classified. This means

that a more or less artificial arrangement has taken the place of the original distribution. Where the forest has not disappeared altogether, it has been driven back on to certain soils, or up to certain altitudes. Cereal crops required either fields or open spaces, while the various trees which man has admitted into competition for his food-supply have been allotted space according to their special requirements. Most have been marshalled within reach of human settlements, special favourites which it is a pleasure to look upon. Chestnut or walnut trees, — depending on location and soil, — to mention only the most common, are the faithful escort of farm houses or villages. The farther north, the more important is the question of exposure, because of the increasing obliquity of the sun's rays. This explains why, on well-exposed slopes, there are either chestnut-groves in tiers, as upon the slopes of Vivarais, or orchards of plum-trees, as upon the most protected hillsides from Aquitaine to the Balkan peninsula. With the wide-spreading fields, these orchards and kitchen-gardens around the houses are one of the two characteristic elements, — and not the less important of the two, — of this landscape of purveyance with which man has branded the face of the earth. In this regard he has supplemented nature. Though the chestnut is no longer as important an item of diet as it was when it took the place of cereals during the winter, yet the density of population in regions of chestnut-culture still is evidence of its attraction for

mankind. The walnut, besides its fruit, furnishes oil, a daily necessity. Plum-harvesting in Serbia and in Wallachian Oltenitza is a season of merry-making similar to that so characteristic of grape-harvesting in France.

Since forests and agriculture are mutually exclusive, the amount of attention given to forests by our ancestors, and the frequent references to them in charters or rural contracts might occasion surprise. The best explanation of this fact is not the forest's value as fuel nor as building material, not even as hunting-preserves, but its importance in hog raising. In districts which today are entirely deforested it is not unusual to see an isolated oak left by chance, or perhaps because of superstition. Such a patriarch is often the last remaining witness to forest or groves which have given way to agriculture, but which formerly grew side by side with crops. "When one runs through collections of charters of the early Middle Ages," says a German forester, Gradmann, "the name of a forest almost never occurs without a reference to swine." This is still the case in France where pannage (*glandée*) is so often the object of transactions and special clauses. The numerous varieties of deciduous oaks, and to a less degree trees like the beech, with triangular nuts, — not to mention the chestnut, — were regarded as food-plants, indispensable elements of rural economy, in contrast to the species which are useful only for their aesthetic beauty or as natural agents, the latter far too little

appreciated. The former had a practical daily utility.

Before the introduction of maize and later of industrial plants had facilitated and still further promoted the hog industry, this prolific animal was one of the mainstays of human existence: in fact, this is still the case. Hogs wallow in village streets; they live with the peasants; their fattening is an object of affectionate concern, their sacrifice an important date in the rural calendar. The year's meat diet is almost exclusively composed of their flesh, with its by-products of various sorts properly treated and preserved. And it was not otherwise in the days when Gallic hams figured in Roman gastronomy, or when ancient texts referred to the innumerable droves of swine roaming about in "glandiferous Pannonia."

IV. NORTH EUROPEAN TYPE

This entire group of food-crops vanishes when the oak gives way to acicular species, black-earth to soils poor in humus, and the growing season of annual plants is reduced to less than four or five months of high temperature. The hog is no longer present among the domestic animals nor maize and winter wheat among the cereals. Along with the foregoing, many fruit-trees disappear, and especially Leguminosae, — various beans, lentils, and peas, which make up a major part of the dietary of the peoples of Europe, — southern importations whose importance fades at about the latitude of Moscow.

It would seem, then, that north of the fifty-fifth parallel rural life could only become progressively poorer and poorer. But it is just here that in the northwest, rather far toward the north, the advantages of a marine climate become effective. Certain vegetables such as cabbage, rape and turnips with fleshy roots, probably indigenous to western Europe, early took their place in the dietary of Celtic and Germanic peoples. These vegetables together with rye, bucolic cereal, and barley, which has the shortest cycle of growth of any cereal, were the staple food-crops of mankind, though the list has been somewhat lengthened subsequently. These cereals, and oats, largely explain why agricultural communities have located in the Far North. Archeological discoveries are proof of the fact. Traces of this early agriculture are distinctly visible in the character of the pottery which dates from not later than the neolithic period.

The influence of the Atlantic is felt throughout this zone because of the west winds, which, after crossing the Channel, the North Sea and the Baltic, continue to have a moderating effect on the climate even north of Lake Ladoga. Weak insolation and short summers are thus compensated by a relatively mild temperature which lessens the risk of frost, and produces humidity, especially good for the growth of pasture. Toward the west, the luxuriance of meadow-grass and development of the edible parts of furze and other plants provide conditions as favourable to the small milch-cow as cereal countries

do to swine, or the half-pastoral, half-agricultural zone bordering arid regions to sheep. This luxuriant pasturage has made it possible for the poorest family to own a cow, which takes the place of the goat in other countries. Here is an explanation of the wide-spread use of milk as food in Europe, while the great agricultural peoples of the Far East have stubbornly refused to make use of it. Another cereal, oats, long viewed with contempt by the people of the South, owes its vogue to the same climatic conditions. Though it does not mature as rapidly as barley, it has nevertheless a sufficiently long growing season between spring and fall frosts, even well into the interior of Scandinavia. Within this zone of grasslands, oats more and more are becoming the favourite cereal, whether as a staple of human diet combined with milk, the porridge dear to the Scotchman, or for fattening cattle native to this zone. Finally, this mode of life, well established in northwestern Europe, was unexpectedly enriched with a plant from Peru, the potato. It grows where oats will not, thrives best in a mild rainy climate, and in first-class fashion meets the newly felt needs of modern civilisation.

As a matter of fact, many additional staples were required if the survival of communities which have continued to multiply during approximately the last century and a half, was to be guaranteed. Where-ever summers were cool enough to reduce the cereal-yield, as in Ireland or the Grass Counties of Eng-

land, or again, wherever peat-bogs and swamps, the legacy of ancient glaciers, had to be colonised, as in Scandinavia and north Germany, new groups of inhabitants settled and have steadily increased. Nowhere in Europe, during the last two centuries, has there been a more rapid growth of population. This has followed, as effect from cause, the growth of big industry and city development. And just along the fringe of this zone, between 50° and 55° north, there is a series of the most important coal-basins, where the chief industrial centres of the world are located, thanks to the use of steam-driven machinery. An enormous demand for food-stuffs resulted from this revolutionary change. Not only were products of the entire world gathered at the supply ports, but an extraordinary additional stimulus was given to the cultivation of crops suited to the climate and to requirements of the population. For example, in the eighteenth century the potato was responsible for the colonisation of a part of Prussia. Today it enables little groups of farmers to live upon the threshold of the arctic zone.

An evolutionary process in northern Europe, thence spreading to other regions with similar environmental conditions, is thus observable in our own day. Long ago, because of economic changes following the Roman conquest, the area given over to the cultivation of wheat, the vine and other southern crops was so enlarged that their cultivation was pushed to the extreme northern limit. Christianity,

in its way, further helped to extend the area; the vine gained ground toward the north which it has not been able to hold. It was not until the end of the twelfth century that wheat-culture began in Norway. Similarly, we can today watch the growth of a type of dietary which has remote origins, but whose development is recent. In this regimen, potatoes, crops for fattening live stock, beef and dairy products play a leading rôle. This is shown by statistics. In Finland, whereas traditional crops like rye and barley have fallen off during the last few years, there has been a notable increase in acreage of potatoes and oats. Denmark, southern Sweden, Finland and Holland are becoming more and more active producers and exporters of butter and cheese, like western Siberia, Canada and possibly in the near future southern Chile. Because consumption of these commodities is constantly on the increase, not only in regions where they are native, but wherever urban life is expanding, dairy produce and city development seem to be concomitant and interrelated facts. Geographical and social causes thus combine to produce a common result.

V. ASIATIC TYPES

Rice. The section of Asia which is under the influence of the monsoons, — eastern India to China, — has also developed its own typical dietary. Because of the immense stimulus given to vegetation by summer rainfall, many food-plants have been developed

which complete their life-cycle in a few months' time and ripen simultaneously. These plants supplied the populations so early established in this part of the world, with the elements of a systematic regimen. Among them is one cereal in particular, whose rapid growth and nutrition value make it pre-eminently suited to cultivation on a small scale. Originally gathered in the wild state, as it may have been, in the lake-like depressions (*jhils*) left by periodic floods of the great rivers of India, rice has become the principal cultivated crop. Man has appropriated it, and by his industry has multiplied its varieties ad infinitum. A series of processes requiring minute attention has resulted in a reward of several harvests a year. The conduct of water into compartments built to receive it, the degree to which the sprouts are immersed in it, the transplanting and replanting of each seedling by hand, not to mention the processes following the harvest (husking, hulling, etc.), require all the combined attention, care, slowly gained experience and family or social collaboration available.

And so it is not enough to say that rice is the staple food of hundreds of millions of men. It is, in addition, in regions where the crop is predominant, a symbol of civilisation. From this angle, Hindu, Malay and Chinese peoples, with their methodical, well-regulated agricultural systems are strikingly different from the tropical Melanesian or Papuan peoples, for whom the mealy pith of the sago-palm

or the bread-fruit tree furnish, with far less effort, the basis of a dietary sufficient for their needs.

Chinese Type. Wherever rice may first have been cultivated, its area is now so extensive, one closely corresponding to that of Asiatic monsoons, that supplementary foods which make up the diet differ greatly according to the locality in question. In northern India, for instance, it is combined with various species of millet called by very ancient names such as *jowari*, *bajri*, *ragi*, and with certain cereals or legumes which can be harvested in the spring previous to the first rice-planting, thanks to the mild winters. Fish caught in fresh-water streams on deltas, in low-lying valleys and lands submerged and exposed by turns, add to the menu, the same parcel of land serving alternately as hatchery and paddy-field. As the falcon was elsewhere used for hunting, so the cormorant, properly trained, has been used for fishing by the ingenious Chinese. Ducks, which are the natural winged occupants of these amphibious regions, provide his table with his only other animal food, — except pork, — for he knows nothing of stock-breeding, and leaves a milk dietary to mountain dwellers and to savages of the steppes. In the southern maritime provinces, Canton and Fukien, the sea is the great provider, furnishing many different articles of food which to our minds give the original touch to the Chinese cuisine. But the Chinese is far from being as much of a fish-eater as the Japanese. His chief nourishment is de-

rived from his fertile and minutely cultivated land. Being as excellent a truck-gardener as he is an indifferent nurseryman, he eagerly makes use of celery, turnip, or onion-like vegetables, which can be raised by his patient use of the spade. And yet, in a climate which grows progressively colder toward the north, there is need of a food more substantial than rice. That is why rice, north of 32°, ceases to be the principal crop. Its place is taken by certain varieties of beans wonderfully well suited to the climate of North China and which, from time immemorial, have been part of the popular diet. The *soya*, with other plants entitled to equal recognition, deserves the gratitude of mankind. In addition to its food-value the seed has certain unctuous qualities which yield substances analogous to oil and butter. A vegetable cheese (*teou-fou*) is also made from it, and being portable, is particularly valuable to the lowest classes of those dense populations.

Japanese Type. Of all the commodities which Japan has borrowed from China, rice and tea are perhaps the ones which have most deeply influenced her habits, even affecting the foundations of society. Their introduction seems to be relatively recent. Toward the beginning of the Christian era, irrigation-works and other requisites for the spread of rice-culture were undertaken in Japan through the initiative of an enterprising emperor. As for the cultivation and use of tea, this appears to be contemporaneous with the introduction of Buddhism, or

between the ninth and the twelfth centuries A.D. As evidences of superior culture, and as part of the long line of successive acquisitions which have enriched its heritage, rice and tea came to be accepted as traditional. The climate, at least to within a short distance of the northern end of the great island of Hondo, was ideal. The growing crops, soaked with rain, bathed with sunlight, received in addition that meticulous attention and watchful care, that affection, even, which the Japanese bestows upon all things of the soil. This achievement of civilisation gained little by little; now it has doubtless become more completely a part of Japanese life than food-products which modern commerce is attempting to import from Europe or America can ever be. But, even so, it remains a luxury. Rice, at least in the north, is reserved for the rich or for the invalid, while tea, because of the ceremonial connected with its use and the artistic beauty of its containers, is one of the elements of the code of etiquette distinguishing a well-bred Japanese. But underneath all imported customs, certain popular, deeply rooted habits of diet still persist. An abundance of game was provided by the forests, — which formerly marked the boundaries between principalities or cantons, — while the clearings, where millet and vegetables were raised, furnished the local food-supply. For the most part, each of the compartments into which the country is divided by nature provided for its own needs. And yet there was one universal resource com-

mon to all Japanese, that of the fisheries. The meeting of warm and cold currents off the coast provides a favourable breeding-ground for a great variety of species, herring in immense quantities, sardines and mackerel, not to mention sharks, which are an important item in Japanese diet. There is no other example of a great people deriving its main sustenance from the sea. Japanese fisheries are today among the most important in the world; it may be assumed that they were the cause of the precocious density of population in this archipelago. The number of persons living directly or indirectly upon the proceeds of fishing was recently estimated at 2,340,000. The narrow, elongated shape of this diffuse archipelago facilitates the transportation of fresh fish. There is not an inland town or village where seafood is not part of the daily regimen, served in various ways, cooked or even raw, well seasoned in the latter case and cut in slices. Fish, sharks even, take the place of slaughterhouse products in our own markets.

We may ingraft our industries upon these peoples. But to persuade Chinese or Japanese to adopt European food is perhaps beyond the power of commerce. There are stubborn racial habits inherent in the constitution, the result of climate, in uprooting which time is of no avail. Although the pastoral activities of the Alps, stock-breeding, and habits of diet deriving from it, have been developed in the pure health-giving atmosphere of those high alti-

tudes, the Chinese, kept away from mountainous regions by miasmas and fevers engendered there by the monsoon climate, has struggled to wrest a food-supply from plains and lower slopes. And although the flavour of fruits is distilled and concentrated during the dry summers in western Asia, an incentive to the natives to perfect the art of horticulture, the peoples of the Far East have remained in ignorance of this difficult art. Even the Japanese, artist-gardener that he is, and painter of flowery branches, has thus far not even ventured to attempt it. Instead of the grape, gradually swelling week by week, slowly ripening in our beautiful autumn weather, there is the leaf of the tea-shrub, whose harvests throughout the rainy season provide the fragrant beverage which, with wine and coffee, has become one of the stimulants required by man, and which he disseminates by means of commerce.

VI. SPREAD OF AGRICULTURAL TYPES

Civilisation has appropriated its favourite crops. Their original habitats have been enlarged far beyond what could have been foreseen. From the original plant countless varieties have been perfected to suit the requirements of different climates, with the result that its importance is often greater in regions where it has been acclimatised, than in those where it originated. For instance, wheat does not today have the largest yield in regions where it was

first cultivated; the harvests of Mediterranean countries cannot be compared with those of the plains of central Europe. The largest ears of corn are no longer grown on tropical plateaus, but in the United States, on the prairies of the Middle West. Nor has the art of water-control with a view to maximum rice production been perfected in low-lying deltaic countries. One district in China is classic in this respect. Near an opening in the mountain fastnesses which hem in the plain of Chengtu on the north, in the province of the Four Rivers (Szechwan), stands a temple which the people have erected in gratitude to the engineer who was able to put into practice and to codify the system of control and regularisation of the mighty floods of the River Min. A series of dams and dismountable contrivances, planned so as to cope with seasonal floods, adjusted to steep gradients, powerful enough and at the same time flexible enough to distribute the water in ditches at different levels, — such is the painstaking work which was finished probably about the third century B.C. Great strands of sand and pebbles were metamorphosed into one of the most fertile and most populous plains in the world. The paddy-fields of the plain of Chengtu are supposed to produce, on a given surface, half as much again as the yield in other provinces.[1]

Tea-culture is also the offspring of the Chinese

[1] Archibald Little, *The Far East*, p. 81, *et seq.* and *La Mission lyonnaise . . . en Chine*, Vol. I, p. 175, *et seq.*

environment. This plant, which has the luxuriant foliage and the proportions of a tree in the high valleys of Assam where it originated, has acquired the delicate aroma which spreads the fame of the tea-gardens of Yunnan as far as northern China, only by reduction in the height of the plant and in the size of the leaves. From Yunnan it has spread in the form of a shrub east and north, finally reaching as far as Japan. The art of its cultivation in a new environment has consisted in creating the best possible conditions of production. By draining, fertilising, weeding and trimming at the right moment, in other words, just before the coming of the rains and rising of the sap, the wild product in its natural state has been transformed and refined. As in the case of the vine, transplanted from the forests of Colchis to dry Mediterranean shores, so has the south-tropical plant of Munipur acquired the proportions and attributes which have become characteristic of it, only when grown in the temperate provinces of China.

The influence of these chosen plants which have become staples of diet or even physiological necessities to millions of men, has often attracted the attention of geographers. Tea and coffee supplied Karl Ritter with subject matter for important chapters in the *Erdkunde*. Their cultivation gives rise not only to interesting social conditions, but stimulates an extensive trade as well. The history of all such

plants is interwoven with that of mankind. They are symbolic of civilisation. Their distribution is an index of man's influence on world economy. Each variety tries to extend its habitat beyond its place of origin; but if dependent merely on its own resources the process of expansion soon reaches an end. When man intervenes, however, the area widens. Undoubtedly tea, grapes, maize, wheat, etc., each remains subject to certain specific requirements of growth. And they are often incompatible. But, as with the majority of phenomena in which man's intelligence plays a part, there is a rather wide margin between a minimum and a maximum area of expansion as far as their cultivation is concerned. Whatever resources and variability lie concealed within the mysterious depths of creative force are released, intensified and amplified by the careful vigilance of man. Nature obeys his dictates. No less remarkable is the fact that the skill which was required in adapting a useful plant to a new environment is also needed later in perfecting it. This is why the best conditions desired and sought by man are not always reached in the original habitat, but in the one to which it has been transplanted. The plant has absorbed all the attention it has received. Man moulds and chisels raw material. He makes stone and metal into plastic forms which please his fancy. But with living species, — especially with annual plants which are more susceptible and more the object of his watchful care, — he does still more.

Each stage of their growth offers him opportunity. Penetrating, so to speak, into their most intimate life-processes, identifying himself with them, he succeeds to a certain degree in modifying the sequence of events in their cycle of existence.

CHAPTER IV

BUILDING MATERIALS

As soon as man felt the need of a permanent home, he built his nest out of materials at hand. But he was greatly influenced by those materials. It is peculiarly true in this connexion that substance dictates form. Conditions of soil and climate have determined whether use of wood, earth, or stone should predominate. But whichever of the three it is, the material guides the hand of the builder, each having its own requirements and, so to speak, its own genius, — peculiarities of form, size and resistance which give a definite character to structures built of it. The result is distinctive types of human establishments which add to the characteristic aspect of the landscape.

Wherever wood is plentiful it has been and still remains the favourite material for the construction of houses and other buildings. Did it not supply beams and other essential parts of the frame-work ready-made? The very method of placing and fitting them was indicated by the character of the material, — witness the manner in which the timbers support the structure, the right-angled corners which determine the position of its walls, the roof which heightens and accentuates its upper surface, the

porches or balconies which adorn its walls. Tropical architecture, — if this name can be applied to the rectangular buildings from central Africa to Malaysia, — harmonises in this way with landscape and vegetation. Subsequently an artistic style grew out of these elementary beginnings, thanks to Chino-Japanese civilisation. The architect in those countries is a carpenter, a fitter and carver of wood rather than a sturdy handler of stone. Japan, in particular, with an abundance of evergreens, hinoki cypress and Cryptomerias, well-nigh indestructible because of their resinous content, shares with Greece, although in a very different way, the distinction of being the most striking example of harmonious adjustment between buildings and environment. Half-concealed among the leafy trees surrounding it, the Japanese Shinto temple of cedar is, in its hoary simplicity, as much in keeping with its setting as the rocky promontory of Sunion with the columns which have given it its name. The average Japanese house resembles a wooden cage lightly placed upon the ground; the restraint shown in the furnishings corresponds to that of the building itself.

I. EARTH AS A BUILDING MATERIAL IN THE DESERT ZONE

But the climate of the great arid tract reaching diagonally from the Sudan to India is not favourable to wood. That most convenient and most familiar material, the one most generally utilised, is not to be

had. At a distance of a dozen degrees or so from the equator trees begin to disappear. There are quantities of reeds, in fact, they have hardly a rival. Bushland, which is valuable for defense purposes, provides shepherds or slave-hunters with the thorny branches and the inextricable brush of which the circular stockades of the *zarebas* are constructed, like the cactus hedges of Algeria today. But such materials are not very well suited to building purposes. The only trees are stunted and dwarfed. The most they can do is to supply the builder with more or less twisted posts, entirely incapable of supporting the weight of a large structure.

Another sort of material makes up for this lack of wood in the arid zone. The clayey soil, — which can be moulded and can absorb substances which solidify and harden it when dried in the sun or baked in fire, — is a material which is easily shaped and which lends itself to many uses. In the hands of the potter it was first used to imitate certain vegetable containers, gourds or calabashes no longer available. (It may be said in passing that the making of pottery, which became an almost universal art in Guiana as it was in Peru, and in China as in Greece, has been neglected only in certain islands of Oceania where vegetation itself made up for the deficiency). For purposes of construction, the use of earth substances has been popularised in the form of brick; combined with steel, it has a tendency today to replace every other material; it meets the ultra-mod-

ern requirements of quick construction, whether of pseudo-palaces or of factories. But if one is looking for beginnings, one must recognise the fact that architecture utilising bricks did not originate in the places where it is most popular today, but in the arid regions of the Old World. The great Chaldean and Assyrian palaces, and even those which succeeded them in western Asia and Iran up to the time of Alexander, were built almost exclusively of clay. In districts so arid that sun-dried brick can be used, it has always maintained its supremacy. In this primitive form, with almost no preparation, it still predominates from Morocco to Persia, even in spite of winter rainfall which sometimes threatens to liquefy the mud-walls. For furnishing such houses, clay is utilised not only for vessels to contain and to cool liquids, but for other objects for which its use seems paradoxical: in Iran as well as in Nubia there are earthenware chests and clay furniture. The native of such regions is earthy in the most literal sense of the word, — earthy in his domicile, whether he builds upon the ground, or conceals himself within it.

The utilisation of earth for building purposes, becoming more and more general as vegetation gradually dies out, can best be observed in Africa. Among the Shilluk on the Upper Nile only roof and stockade are made of thatch, the circular hut being of earth. Even in the back country of Togoland extensive fortifications with bastions of hardened earth,

connected by curtains of the same material, are covered with conical roofs which alone are made of leaves or straw. Farther north, near the fourteenth parallel, the Sudanese village of Zinder is surrounded by a mud-wall, its tortuous streets lined with houses of *touba* or sun-dried bricks, while in the Saharan Sudan the use of earth and pisé is universal. Ramparts, houses, granaries and *tatas* (fortresses), are made of it; so that this type of construction becomes more general as aridity increases. It is used almost exclusively in the Saharan oases. In southern Morocco the building material is *tapia*, another form of the same substance, in this case a fat clay trodden and mixed with chopped straw and pebbles. The terrace or flattened cupola in place of a roof and the exclusive use of earth for building are significant and related facts. With the disappearance of the roof, — runway for dripping rain, — goes that of the wooden frame-work which served as its support.

No other material enables man to establish himself more easily, none was earlier used in localities where climatic conditions permitted. He had only to dig to obtain ready-made walls, or to lean over and pick up the materials of which to make them, as the case might be. Sand, indurated and cemented by infiltration, the compact alluvial land of Egypt and Mesopotamia, the clayey soil of the Armenian plateaus or of Iran, — even of Europe and central Asia as far as North China, — the vast waste of

steppe-soils known by the name of loess, with their myriads of calcareous concretions, all of these have in one form or another been made use of by human establishments.

In Spain, homes in the ground are common in Guadix, province of Grenada. Among the Matmata of southern Tunisia the domicile consists of a rectangular court hollowed out of the sand, flanked with small rooms. Elsewhere the excavation is made in vertical walls. Since the time of Richthofen the villages nestling like cells of honeycomb in the perpendicular walls of loess in the provinces of North China have been familiar to all. A network of paths dug in the ground connects these habitations. Sometimes the village burrows so deep that its existence can be guessed only by treetops which indicate its position.

If, on the other hand, the structure rises above ground, it is built at little expense, and it is easy to make another, in case of necessity, to replace the first. It would be futile to try to utilise the lumps of mud which have been used once before. They are good for nothing. The house is therefore abandoned as easily as it is built; it is no more permanent than a shepherd's tent. But it is rebuilt on almost the same spot, for it is held there by agricultural pursuits. All censuses made during the last few years in Egypt agree that in addition to myriads of occupied huts there is an enormous number of deserted ones. They stand as they are, abandoned, without any one

taking the trouble to use the materials of which they were built, until the pile of débris has become formless and hardly recognisable. The ease with which they can be replaced is a climatic fact which has not been without social influence in the earliest stages of human occupation of these alluvial regions. The soil supplied a means as simple as it was economical of adding to the number of houses in a given locality, of there erecting temporary residences depending on the season and river-floods, and of substituting a healthful abode in place of one contaminated by too long occupation, — all of them conditions which have doubtless contributed to the growth of such dense populations in these districts. Let us not forget that a permanently dense population is the result of long-protracted effort and the combination of many different causes. One of these causes has been, without question, the general use of a material which is dried by the sun and which can be used almost without preparation because of the arid climate.

Earth and sun-dried brick are such economical materials that they have been extensively used by man, even in climates where their use is not clearly indicated. Loess provided dwelling-places in Moravia and even in Alsace in prehistoric times, just as it does today in Danubian Bulgaria or in Dobruja. It is less surprising to find loess used in combination with pisé and reeds in the construction of stockades built by the Chinese in central Asia. But in this type

of construction the one element which gives to human establishments a geographical significance is lacking. This essential element is durability. Villages and even cities in the arid parts of Chaldea, Susiana, Seistan and central Asia have been constructed exclusively of clay and sun-dried brick. Formless mounds with fragments of pottery are today the only witness to their existence. The Arabic word *tell*, so widely used in Babylonia, on these alluvial plains refers to hillocks which are merely the remains of human establishments. Crumbling walls, which collapse for lack of stones to protect the corners, provide a nucleus around which gather clouds of sand driven by the desert winds. Sand soon collects in such quantities that the whole is eventually reduced to a pile which naturally takes the shape of any mass of movable material. The work of man has capitulated. Nature has once more taken possession of the soil. Nameless cadavers of cities lay thus sleeping beneath a pall of dust when Xenophon with his Ten Thousand traversed the plains of Mesopotamia.

Let us note in passing that such a state of decay is not in itself a sure proof of great antiquity; because, in this climate, physical agents conspire with flimsy building materials to wipe out quickly any pronounced or prominent form. Neither should one be misled by the quantity of ruins on the plains of Chaldea, for example, or of Seistan, — districts which today are reduced to a state of utter solitude. The

present decadence is doubtless sufficiently explicable on historical grounds. But it must be said nevertheless that the hazards of war, or destruction of irrigation-canals, have resulted in the rise and fall of establishments in such rapid succession that any estimates of population based on an assumption of their synchronous existence would very probably be incorrect.

When buildings of earth do not crumble to pieces they collapse. Water is the chief agent of destruction. The walls of Persian villages dissolve in the winter rains. Walls of pisé and small pebbles built too close to rivers in flood, — such as the Garonne, Loire, Rhône and Rhine, — cave in. Stone is the only material suitable for building near rivers. Since it is more durable than wood and less subject to conflagrations, and better than brick for taking shapes and strengthening walls, stone is a guarantee of whatever permanence is consistent with human undertakings. If comparison were made between countries where the use of stone is general, either around the Mediterranean, or on the plateaus of America, or in northern India, and those where earth and brick predominate, the contrast would be striking. The pyramids of the fourth dynasty are almost as perfect today as when the blocks were hewn from the quarries of Mokattam. But in Chaldea one may search in vain for any trace of many cities mentioned in the texts, — and in Mongolia even the site of Karakorum is difficult to locate. The only evidence as to the routes which once traversed that part of

central Asia is found in the presence of occasional stone towers to which Ptolemy referred. And all that archeologist and geographer can discover of the commercial or military highways which had been constructed under Chinese sovereignty from one end to the other of the continent, are occasional stockades of daub and wattle. On the other hand, the network of Roman roads is almost as perfect as the day it was built. Would it not be impossible to gain any idea of ancient American civilisations if there were nothing but the testimony of the mounds or tumuli of earth scattered here and there in the Mississippi Valley? A measure of those civilisations is supplied, on the other hand, by the great pyramidal buildings and the terraced-structures built by the Maya of Yucatan (Palenque) or by the Quichua of Peru (Tiahuanaco near Lake Titicaca) which so amazed the Spaniards; or by the remnants of paved road which, after the manner of Roman roads, connected Cuzco with Quito on the plateaus of Peru. The fact that calcareous or volcanic rock was available and was made use of by those peoples, — Maya, Aymara, Quichua, etc., — enabled them to leave upon the soil an indelible mark which has saved their names from oblivion.

II. STONE IN THE MEDITERRANEAN REGION

The lustre of certain mineral substances had a fascination for man and tempted his ingenuity and skill. He did not hesitate to tackle the hardest ma-

terials, even with the crudest implements, if their polish and their brilliancy had intrigued him ever so little. To primitive man flint was not merely a substance for making weapons when occasion demanded. It was a material of which paleolithic artisans, in Sweden for example, knew how to fashion carved celts and daggers which are accounted marvels of workmanship. Jade in eastern Turkestan, agate, jasper, serpentine and rock-crystal in Japan and China, diamonds in India, obsidian in Mexico and Peru, — all were patiently and lovingly carved and fashioned. The movable treasures of the ancient Japanese (*magatama*) were veritable jewel-caskets. The granite and porphyry tombs of the Pharaohs, after four thousand years, still have mouldings intact and a polish which delights the eye. The oldest Chaldean art as well as that of Egypt used basalt, an indestructible material, for statues. Works of art were luxuries, and trade-routes were planned with a view to procuring the materials of which to make them. In this way, perhaps, man may have been led to search for metals. Was not gold in shining nuggets the first metal to be exploited?

But the geographical significance of stone consists primarily in its usefulness as building material. Both granite, which chips off under pick and hammer, and schist, which scales off in slabs, have their uses. But the building-stone par excellence is that which can be chiselled, cut in even blocks and fitted, thus lend-

ing itself to the construction of all the different shapes and combinations of shapes which the skill of the architect can imagine or devise. Limestone and, to a less degree, sandstone have supplied the material for a varied artistic development. A relationship exists between stone and edifice. Mayan construction cannot be thought of apart from the limestones of Yucatan, just as the sandstones hemming in the Valley of the Ganges on the south bring up images of the innumerable monuments in the cities between Delhi and Benares, or sandstones of the Vosges the cathedrals and castles of the Rhine Valley. The numerous rock engravings of the Algerian Sahara which show the early artistic aptitudes of the Berber race are carved in sandstone. Sandstone has preserved in astonishing perfection mouldings and ornaments of the buildings of Petra. The fortified Pueblo villages in Colorado and New Mexico are usually made of sandstone quarried in the vicinity. So close is the connexion between stone and edifice that often, as at Les Baux, Provence, stone and dwellings are indistinguishable in a blur of blinding whiteness.

Nowhere has stone architecture had a more beautiful abode nor made better use of it than round about the Mediterranean. The eastern basin is bordered on the north by the folded chains of the Taurus Mountains and Dinaric Alps, while the plateaus of Palestine and Arabia Petraea, of Libya and Cyrenaica, surround it on the south. The Apennines connect with the chains and plateaus of Provence,

while from Spain the mountains reach, by way of the Balearic Isles, as far south as the Atlas. And so the frame is almost complete. Everywhere, except where deltaic alluvium has built up thick layers of humus, outcrops of rock are hardly so much as sprinkled with earth, which is reddish in colour. White stone, constantly renewed from beneath, makes a dazzling surface. It seems to grow like grass. This stone, which generally can be easily worked in the quarries or *latomies*, has the property of subsequently hardening in the open air. The sharp edges made by the workman's chisel are preserved indefinitely in the turning of corners and fluting of columns. Near Archean massifs in Attica and the Cyclades, Carrara and the Pyrenees, wherever the rock has been metamorphosed, it has a marble, crystalline texture. But limestone is used for the manufacture of cement, so that more than one precious ancient ruin has found in the lime-kiln the humble fulfillment of its destiny. Exposure to sunlight and the patina of time suffuse these Greek or Italian marbles, or the fresh-water travertines of the Roman campagna, with a rich, warm colouring, thereby adding the effect of climate to that of soil.

Mention must be made of other building-stones which have been extensively used, particularly lavas, dalles or peperino, resulting from the ever-active volcanism of the Mediterranean region. But the predominant rock, the one which gives the inherently characteristic aspect to the Mediterranean land-

scape, is limestone, upon which the carpet of vegetation is seldom thick enough to cover the bare surface.

In the area under consideration there is no lack of hard, resistant woods suitable for building purposes. In Egyptian buildings, as in towns of the Mycenaean era or in the most ancient Greek temples, the wall-supports are made of wood. That wood was formerly used to the exclusion of other materials in certain types of construction, is suggested by some of the sepulchral monuments of Asia Minor, as well as by the classic Greek temple with columns and pediment. But in general stone has taken the place of wood.

Around the Mediterranean this stone is found in so many familiar forms, and fills such varied needs, — being used for purposes of defense, shelter and storage, — that it is intimately connected with local customs and occupations. The terraced walls which hold the soil upon the slopes are built of it. And in this way the planting of crops as well as fruit-trees on the terraces which sculpture the mountain flanks up to a height of five or six hundred metres, became a general practice. Hauling the blocks, laying them in courses, adjusting their reëntrant and salient angles in such a way as to form strong, thick walls, is an essentially Mediterranean art, whose venerable origins can still be observed at Tyrinth and at Norba. Stone-fitting is an essential part of terraced orchards and gardens. In Morocco, stone enclosures (*decherras*) surrounding cylindrical pits with rounded

sides hollowed out of the earth, take the place of the thorny stockades of the subtropical regions. Granaries or reservoirs lined with cement are used in Syria and Palestine as well as in North Africa, and in Biblical times as well as in our own. Solid rock, either by reason of caves or because of what is hewn from quarries or found upon the surface of the ground, has lent itself to the requirements of domestic life in as intimate a manner, — useful in a thousand different ways, — as wood and vegetable fibres have done in equatorial or northern forests.

And so the Mediterranean region should be considered the mother-country of the art of stone construction, whence, after having inspired various types in its native land, its influence has spread in all directions. There is a family likeness between the Hellenic acropolis, the Italiote *oppidum*, the Arab *bordj* and the Berber *casbah*. They are built of the same materials and choose the same commanding positions on rocky prominences. On the coasts of Liguria or Provence their crumbling walls are perched like eagles' nests commanding the distant horizon. Structures of the Mycenaean type which seemed hoary with age to Greeks of the classic period, are not unlike the ancient fortified enclosures which are called *nuraghi* in southern Sardinia, and *talayoti* in the Balearic Isles. They were doubtless built for similar purposes of defense. All primitive Mediterranean life found its expression in stone. Ancient Apulia, like the land of Canaan, still bears its stamp. Le

Murge in the district of Bari and Otranto is studded with cylindrical buildings, tapering at the top in a succession of steps, known by the name of *trulli.* They are found in more rudimentary and primitive form in occasional structures upon the sides of the Central Apennines, on the Dalmatian Karst, even as far as the southern coast of France. Most of them all, Italy is forever branded with the grandeur that was Rome. On a more humble scale, does it not still remain the centre from which artisans in stone and marble go forth into the whole of Europe?

This is not the place in which to analyze the rich and varied architectural forms which have been evolved from such primitive beginnings. Out of these materials the architect has built pyramids and pylons, columns and porticoes, arches and cupolas, — all the remarkable flowering of art embodied successively in Egyptian, Hellenic, Roman and Byzantine schools. We are not looking for a lesson in art from its monuments or ruins, but for example of the influence of durability on human establishments, and through them on history.

Thucydides, in an oft-quoted passage, remarks that if Athens and Sparta were to fall in ruins, anyone unfamiliar with their history would be tempted, after a glance at their monuments, to exaggerate the importance of the one and underrate that of the other. What he said of Athens would apply even better to Syracuse, built on limestone, riddled by

the famous *latomies* which lend it an almost unparallelled grandeur. On the line of rocky hillocks stretching from Achradina to Epipolae, to the little island where the city originated, one can take in at a glance the development whose successive stages are forever carved in stone. This is the sort of past which cannot be obliterated.

The abundance and beauty of material gave rise to such a burgeoning of monuments on these classic shores that even in a state of decay they constitute one of the most connected series in the ephemeral history of mankind. The hill of the Jebusites which later became Jerusalem, the acropolis of Cecrops, later Athens, and the *Roma quadrata* of the Palatine, were nuclei of subsequent developments, which, after many vicissitudes, have nevertheless continued to survive on the very same spot. On any given site the series of events by which the earliest walled enclosure and ancient *oppidum* were transformed into a city which developed into a centre of civilisation, — a work of art, with its temples, its porticoes, its theatres carved in stone, — is a lesson from the earth itself. It is all as indestructible as stone. The healthfulness and beauty which the modern city in central Europe or the United States tries to gain by wedging parks between blocks of houses, or bits of forest between its streets, the stone and marble city on the shores of the Mediterranean obtained from the cool shade of its porticoes and from the marble slabs of its buildings wide open to the air.

Such a town, like its present-day descendents, preferably chose commanding sites freshened at certain hours of the day by a breeze from the neighbouring sea, heights beyond the reach of malaria, summits buffeted by salt sea-winds.

When the vigourous life which throbbed in such structures of stone ebbs or dies out completely, the ruins still enable one to imagine what they must have been originally. The phrase by which certain ancient authors aimed to express complete annihilation, *etiam periere ruinae*, means nothing in this locality. The vitality of Mediterranean civilisation is due in part to this continuous series which materialises its history, so to speak, and perpetuates its traditions through the enduring commentary of its ruins and monuments. Most Mediterranean cities of antiquity were rooted deeply enough so that their life has continued, in some cases uninterruptedly, like Marseilles, in others intermittently. At any rate, when their historical destinies have been fulfilled, a period of latent life has followed the period of greatest expansion in the same places. Attachment to the site persists, thanks to the building materials collected there, but at their expense. Salona, though destroyed, lives again in Spalato. Villages nestle among the ruins of Antioch and Ephesus. Historical catastrophes which annihilate cities cannot banish all traces of human establishments from the places where they had taken root. They continue to exist in more modest form, with stature reduced, just as

underbrush replaces the forest which has been destroyed.

The idea of durability in connexion with buildings of stone is deeply rooted in the human mind. In the calcareous districts of Caria and of Lycia in Asia Minor there are many funeral monuments of the Hellenic period on which are written the words: *οἶκος αἰώνιος*. The expression "eternal mansion" applied to the tomb is justified by the permanence it acquires from the rock out of which it is hewn, or from the stone out of which it is built. In the sepulchral monuments of Egypt or of Mauretania the proud claim to eternity tries to assert itself in structures built of stone blocks, whose colossal size defies the ravages of time. When man wished to prolong his life or the remembrance of it after his death, to project his personality, as it were, beyond the bounds consistent with his brief existence, he resorted to the use of stone.

III. WOOD AND STONE IN CENTRAL AND WESTERN EUROPE

The cylindrical houses to which Strabo refers, built by the Gauls of beams and wicker-work and covered with roofs of thatch, belong to the field of archeology. Even when they settled in districts south of the Alps they kept to the habits formed in the forests of central Europe.

Wood was used in place of Mediterranean pottery and ceramics for various purposes. The cisalpine

Gauls had oak kegs "as high as a house" instead of the jars and amphorae of their Italian neighbours. The oak chests and wardrobes in use among our peasants today often excite the wonder of foreigners.

The use of wood as a building material has been more general and has persisted longer in central Europe than in the Mediterranean region. The Gallic houses described by Strabo resemble the cylindrical huts shown beneath the torches of the legionaries in the reliefs on Trajan's column. The Dacians had no other dwellings. As for the Germans, says Tacitus, being unfamiliar with cement and brick, they make use of formless piles of material, "*materia ad omnia utuntur informi.*" Such vague statements as this are suggestive of the earliest stages of an art of construction destined to assume greater and greater importance later on. These crude workmen made use of just such a combination of wood and mud, though improved and diversified for building purposes, as continues in general use today, particularly throughout much of northern France and Germany.

Wood was used for the framework of a building before it was used for decorative purposes. Such a skeleton gave a certain stability to the loess or loam-built walls, which were inadequate to withstand the severities of a northern climate. This unique combination of two different types of material, the one fire-proof, the other rain-proof, was a guarantee of durability. Good effects were obtained from this

combination in opulent and elegant Normandy and in Picardy near by. Upon a foundation of resistant churty rock, intersecting beams made a tracery of geometrical design upon the surface of pisé. This type of building, called *Fachwerk* in German, has elsewhere given rise to numerous variants typical of farm or village houses in Alsace, Swabia and Franconia. The entire continent of Europe, formerly more forested than today, lives again and is revealed in the picturesque development of this art of construction whose formless beginnings could excite only the contempt of Mediterranean peoples, accustomed as they were to edifices of stone and marble.

Of all the varied uses to which the different deciduous trees of Europe have been put, — such as the making of furniture, agricultural implements, wheeled vehicles, wicker-work, etc., — construction of the framework of buildings is among the most important. The peasant's hut was not the only structure strengthened by a skeleton of oak. When the art of certain districts in northern France had advanced to the stage where buildings of stone larger than the Greek temple or the Roman basilica were constructed, huge oak or chestnut beams were used for part of the framework of cathedrals or *halles*, from Chartres to Ypres. Forests as well as stone-quarries have been swallowed up in such structures.

Any attempt to make a regional classification of Europe based on the distribution of building materials at the present time, would be forcing the point.

A distinction can be drawn, however, — as Solovief has done by confining himself to certain characteristic traits still so clearly marked in Russia, — between the Europe in which the use of wood predominates, at the north, and the Europe which utilises stone, toward west and south.

In western Europe a variety of soils has from the beginning meant a variety of materials and consequently of style of building, — differences which time has served only to increase. Migrating peoples have introduced different customs, — because when man migrates he likes to carry his shell along. Wherever he is, he seeks to adapt his home to his occupation and to his individual tastes. The Anglo-Saxon, like the Spaniard, has taken his favourite style of architecture to America, and his customary arrangement of living-quarters. Sometimes there are intentionally different types side by side. In central Europe, for instance, it has been possible to make a classification, — a little arbitrarily, to be sure, — of types of rural architecture characteristic of local Germanic tribes which had their domain between Slavs and Latin peoples.

One would be liable to frequent error in attempting to make types of construction depend exclusively on the nature of the soil. This is even less the case at the present time than formerly, because of ease of communication and of industrial manufacture. If brick and iron, made cheaply and in bulk, have a general tendency to replace all other materials, in

town and country alike, it is but one aspect of the age of coal and steel, mighty forces of our time. Individual and regional differences, however, will never be entirely obliterated. Even in sophisticated Europe regions still exist in which use of earth or of stone or of wood still dominates, by virtue of soil requirements. They are natural provinces as it were, with traditional boundaries still almost unbroken.

The chalet is a type of dwelling inseparable from the Alps. With large schist slabs for foundation and with framework and overlapping shingles of wood, this type of building is characteristic of the Alps from Savoy to Austria. The wooden house, in various forms, is common in Bosnia and Serbia as far as Mount Kopaonik. In the great forests of oak bordering the Save on the south local materials are still used for the most part. Both raising of live stock and building practices teach, so to speak, the same geographical lesson.

Not only are there striking contrasts between regions where stone is abundant and those where it is not, but they persist longer than one would imagine. The time has passed, it is true, when wooden highways, *pontes longi*, served as roads across the sands and bogs of the Germanic plain. But mixtures such as pisé or earth mixed with chopped straw, earth and pebbles in alternate layers, loam with foundations of hard churty rock, loess with a pattern of intersecting beams, are but various artificial substitutes for building stone. Beauce, for instance, with its loamy soil,

continues to build its houses of pisé with roofs of thatch. In Champagne it is not long since poor little huts of pisé, held together by wooden joists almost buried beneath the cover of thatch, were universal where today brick houses with tile roofs reign in all their glory.

Inherent differences have been intensified by local architecture. Districts in which use of loam and brick is prevalent have today a stamp peculiar to themselves, given by massive structures built of those materials. They are even touched, sometimes, by a breath of art. The district of Toulouse differs from that of Bordeaux as the marble of the Ardennes, or the stone of the Ile-de-France and Normandy, differs from the clay of London and Flanders. There are beautiful edifices of brick at Albi and at Toulouse. In such towns the architect has endeavoured to produce an appearance of massive building, and, with the only means at his command, to elevate brick to the dignity of stone. But the latter has the advantage of plasticity and life. Beauty of raw material was combined with highest art to produce the edifices which are the pride of Caen. They seem to have sprung full blown from the Norman quarries out of which great blocks were hewn to construct cathedrals on foreign shores.

Naturally the impress of the environment on ordinary buildings is deeper than upon works of art which can command the resources of distant lands. Of all the countries of transalpine Europe France is

the best supplied with building materials. The wide distribution of Cretaceous and Jurassic limestones gives a highly characteristic appearance to the buildings in their vicinity. Artificial cavities hollowed in the tufaceous chalk escarpments of the valleys of Touraine, — such as those of the Loire, the Indre and the Cher, — show plainly, even if they are no longer dwelling-houses themselves, what was the source of the white houses lined up at the foot of the slope. The same calcareous strata which have supplied Paris with the beautiful stone which with time takes on a delicate grey patina, underlie the succession of lovely villages, — both those from the mouth of the Oise to l'Isle-Adam and those farther north, between Soissons, Noyon, Coucy and Laon, — along the entire fringe of the dissected plateaus of the Ile-de-France. The characteristic massive appearance of these regions is shown in countless details and reflected in the humblest structures. It is due to the quality of stone quarried in the vicinity. Side by side with the *creuttes* and the quarries not yet entirely deserted, are houses with gable-ends cut in steps, with carved doors and casements and wide, beautiful staircases, — evidence of the long familiarity of the people with a medium which was easily workable. The darker limestones in the basin of Lorraine and Burgundy give to the compact villages huddling close to the foot of the *côtes* a more sombre tone, intensified still more by the grim look of the roofs made of overlapping slabs of the same

material. Upon the plateaus of the Jura with their white rock ribs, the dwelling is larger and more spacious. In this case the stone house is but an outgrowth of the soil itself. It is an integral part of the sum of different elements which characterise the landscape as a whole.

The advance of European civilisation from the shores of the Mediterranean to the edge of the northern forests is marked by a line of stone structures. Cement combined with stone has made it possible for the network of Roman roads to endure throughout the ages, and under the name of *estrades* or *estrées*, *chemins ferrés*, *perrés*, *voie de la Péreuse*, etc., *Hochstrasse*, or others equally descriptive, to serve as a model of construction for highways, and, even at the present time, to determine the direction of modern travel.

The presence of a belt of beautiful limestone rock across Aquitaine, from Quercy to Poitou, is indicated by the number of ancient fortified sites, Gallic *oppida*, fortresses and walled enclosures, etc., all in line, as it were, from the famous sites of Uxellodunum and Cahors to La Rochefoucauld and Angoulême, and thence toward Lusignan and Poitiers, bulwarks of feudal military architecture.[1] The northern arc of the great calcareous belt across Burgundy and Lorraine is traced by an analogous series of fortified sites, with their early accretions of human

[1] See *Atlas général Vidal-Lablache*, Paris, 1923, p. 61, pp. 93e-f. — Trans.

establishments. In Burgundy, ancient fortified sites from Rena to Alise-Sainte-Reine trace its route. It marks the military frontier of Lorraine from La Marche to Vaudémont. In this same locality, later, but for the same reasons, occurred the flowering of architecture of which Cluny was the focus and of which the church at Vézelay, — isolated outpost on a limestone hill near the Morvan, — is now the chief representative. The majority of the most ancient fortified English towns such as Chester, or of bridge-heads such as Oxford, follow the limestone hills surrounding the basin of London or the chain of hills which extends in a northerly direction as far as Cape Flamborough by way of Lincoln and York. These lines of ancient edifices have brought into relief the political skeleton of the regions in question. There is a similar case in Germany where the belt reaching from Basle to Bamberg crosses Swabia and Franconia. It is not mere chance that many of the rugged heights along its course are sites of fortresses made illustrious by such names as Hapsburg, Hohenstaufen and Hohenzollern. Northwest of the Harz Mountains the limestone slopes near Hildesheim are not far from the town whose architecture and monuments are the most ancient and the most remarkable in northern Germany.

The gradual replacing of wood by stone has kept pace with the march of progress. The twelfth and thirteenth centuries which witnessed the reëstablishment of order and security in Europe, were also those

which witnessed the triumph of stone. Then it was that cathedrals were reared and that at Paris, on the Seine, at London, on the Thames, and elsewhere, stone bridges took the place of primitive wooden bridges. At Avignon, Pont-Saint-Esprit, on the Rhône, the Bridgebuilding Brotherhood (*Fratres Pontifices*) was already at work. Under Charles the Bald the fortifications of Pont-de-l'Arche had already blocked Norman raids by way of the Seine. Stone bridges fixed the location of permanent river-crossings, stopped invasions and determined political geography, like the towers and walls which invariably surround the cities in old engravings. But for a long time the east and north remained detached from the rest of Europe. In forest-covered Russia north of 55° or in Finland, as throughout most of Siberia today, the cities were built almost exclusively of wood, and were so very inflammable that after a conflagration the inhabitants were tempted to abandon the site. Cities like Bolga on the Volga, Julin or Vineta on the Baltic, and Biska, Sweden, have disappeared without leaving a trace behind. No such fate could befall the zone between Oxford and Prague where at a very early date monuments of stone were reared and became identified with the landscape.

IV. WOOD IN NORTHERN EUROPE

One of the most marked changes in the world of vegetation occurs when the various deciduous species

predominant in lower latitudes gradually give way to the coniferous forests of the north. Little by little trees which had been invaluable assets, such as the oak, — worthy to succeed the olive as king of trees in the cold temperate zone, — the ash, — still valuable for the construction of wheeled vehicles and agricultural implements, — and the yew, — whose tough, flexible wood has so many different uses that its distribution seems to have shrunk perceptibly because of careless exploitation within historic times, — these trees gradually disappear, as box, chestnut and walnut had disappeared before them. This varied company makes way for a uniform expanse of pines, spruces and larches, — forests almost without underbrush. Here and there, however, in clearings and river-valleys, some deciduous species have crept in, — poplar, alder, sorb, and especially the birch which, because it is tough and hardy, is found from Siberia to Scandinavia and from Canada to Alaska, throughout the entire land area encircling the North Pole. Nature becomes more and more impoverished; settlements are made more slowly and with greater difficulty; the houses are no longer surrounded with orchards. This change becomes conspicuous at about 55°–60° in Europe, and at 50° in North America.

Yet this world of nature, impoverished as it is, is not barren by any means. New resources take the place of old. In these coniferous forests, tree-trunks filled to overflowing with resinous substances furnish

building materials incapable of decay. The pliant birch with its delicate, elastic bark, can be put to almost as varied uses as bamboo in other latitudes. The wooden sled slipping and sliding along over the moss beneath the scattered trees and the small boat portaged across from one still reach of water to the next, are ingenious, novel devices for making use of it. Such originality was first displayed in vehicles for transportation, — quite natural in localities where life was and still is in part conditional on seasonal displacements. Other developments will follow with the march of progress. But there is already a sufficient consensus of opinion as to the ethnography of primitive peoples, — Finnish tribes of northern Russia and natives of northern North America, — to prove that in spite of many inherent difficulties, occupation of such areas has been intensive and of sufficient long standing to have created there as elsewhere a material in keeping with the environment.

Modern civilisation in its most pervasive form, — industry, — has invaded this zone with a determination of which it is at present far from having shown itself capable in the tropics. Very few vegetable products of equatorial forests have as yet been made use of by our great modern societies; while, on the other hand, the northern forests have long been furnishing world commodities. They no longer supply merely local needs of the natives but an increasing industrial demand. Their mineral resources are

also being developed. Mines were exploited in the early days by the Chudes of northern Siberia just as iron is mined today in the northernmost parts of Scandinavia. The enormous reserves of power latent in the quantities of water in such regions are being developed more and more. The result is that to our amazement newly created centres in addition to the historic towns of Moscow, Petrograd and Stockholm are beginning to grow up, — nurseries of cities, as it were, in Finland, Scandinavia and British Columbia, where formerly embryonic settlements drowsed in peace and quiet.

Cities, entire regions even, are rapidly transformed by the use of brick and granite. But natural conditions have not yet said the last word. In such harsh climates, where winter is seven or eight months long, buildings of logs are the warmest, so they are preferred and justly so, even in spite of fire-risk. Most cities in North Russia have given up their wooden stockades and enclosures. And yet many quarters even in Moscow remain loyal to the time-honoured materials. This is particularly true of rural habitations. In Norway one of the bright spots in the landscape beneath a sky dappled with passing showers is the house whose bright-red walls glisten in the sunlight. Within, shining walls and closely joined boards give forth a resinous odour. In the village of North Russia the carved gables of its wooden houses, decorated with brilliant colours, turn toward the broad street which is the axis of the town. With

the progress of culture and well-being the Russian *izba* has in fact supplanted the crude, rudimentary Finnish *kuta*, whose low roof of branches and sod still rises here and there in remote corners of that swampy country. In the Russian *izba* a wooden floor takes the places of the floor of earth, windows and other openings make a passage for light and smoke, and benches along the walls and board partitions divide the dwelling into several compartments. The carved and painted window-casements, and weathercock in the form of a bird surmounting the roof, give to the house a gay and picturesque look. It appears, outwardly, to be what it is inherently, — a creature of the environment. One feels that the affectionate skill and imagination of the builder have been lavished upon it. The same artistry displayed by the muzhik in building for himself with materials at hand a dwelling suited to his needs and tastes, is apparent in wooden objects of every shape and size, and suited to every need, which he has fashioned with no tool other than a hatchet. The muzhik is of necessity a born carpenter. The habit is inherited, required by environmental conditions. They are responsible for the innumerable domestic industries still thriving in the land of the muzhik. "One cannot imagine the number of articles which can be made out of wood without so much as a speck of iron," remarked a metal-worker, with a touch of wistfulness. The Russian *izba* and the Finnish and Scandinavian house, such as it has become in the

hands of many generations of peasants, with their chests of birchbark, their shelves covered with knick-knacks and their picturesque decorations, are all the most direct expression of an indigenous civilisation, sprung from the heart of a harsh environment. Is not the house, after all, wherever it is, a pretty fair index of the mentality of its occupant?

CHAPTER V

HUMAN ESTABLISHMENTS[1]

Human establishments add colour to the landscape. After a climb in high mountains it is a delight to see the first hamlet. This impression is gained from reading Richthofen, as day by day he notes the striking sights of the journey, also from Barth, as he passes from Sahara to Sudan. A town, a village or a hamlet, all are descriptive traits of any region. Shape and building materials as well as adaptation to a mode of life, — rural or urban, agricultural or pastoral, as the case may be, — all throw light upon relations between man and the environment. There is a great variety of human establishments, but they should be studied from every angle in order to give each element its due. The first to be considered is that of the site, for it is the one in which geographical influences seem to stand out most prominently.

I. THE SITE

Temporary and Permanent Establishments. Some establishments are merely ephemeral. During the

[1] The phrase "*établissements humains*" has no precise equivalent in English. It means "structures built by man to house himself and his property," which may be either temporary or permanent, either isolated or in groups. — Trans.

Roman epoch the Germans had villages, but, like those of the North American Indian, they were often temporarily deserted for hunting or the search for food and clothing. They were sometimes abandoned altogether and new ones built. The location of a Negro village in the Sudan may be changed if the soil is exhausted, or if it becomes unwholesome, for such a settlement is entirely at the mercy of an epidemic. The permanence of an establishment bears a direct relation to locally accumulated wealth, to the number of improvements and to relationships with the outside world. The African village whose site may be changed by a mere accident, and the European village whose history is traceable for thousands of years, are as widely different as the city of antiquity and the immense metropolis of today. The distance is that between a rudimentary and an advanced stage of civilisation.

If the ephemeral establishments of primitive peoples are excepted, refuges and occasional shelters should likewise be omitted. In a chronic state of lack of security human establishments withdraw from sites which would be occupied under normal conditions. Instead of settling where natural resources are plentiful and where space is not too much restricted, they seek out inaccessible places, — great stony wastes like those in certain parts of Africa, or rocky heights like those of the ancient *oppida* on Mediterranean shores and French feudal fortresses, or islets or capes where settlements were distributed

throughout the Mediterranean area by the Phoenician Melkarth or Astarte. But such sites are not permanent; they are abandoned as soon as circumstances warrant, and they survive only as ruins. Then natural conditions begin to function, — just below the deserted fortress a town or village springs up and begins to grow. "As soon as there was any feeling of security against pirates," says Thucydides, "cities advanced toward the sea." And when piracy gave way to commerce, the very islets upon which the germs of cities had been scattered by the pirates themselves, began to enter into relations with the mainland, establishing connexion with it by boat. Tyre, Syracuse and Alexandria thus broke their shells. And then, from the moment when the establishment found or created conditions favourable to vigourous growth, it showed signs of a peculiarly firm hold on life, surviving even the revolutions of history.

By founding establishments where results of the labours of succeeding generations can be accumulated in certain advantageous spots, man has a lever for use not only in the immediate vicinity, but sometimes at a distance as well. Such establishments have geographical importance not only in themselves but because of the way in which they modify their surroundings. Not to mention the remote and almost incalculable influence of the great cities of our time, even an ordinary town creates its suburban area, in a measure transforming its surroundings. A vil-

lage distributes crops so as to make their cultivation most convenient. Even hamlets, farms or isolated houses, with their trees, garden-plots, orchards and out-houses, separate various crops which would dovetail in a state of nature. The resulting arrangement of fields, meadows, orchards and woods is one to which we have become accustomed. The appearance of a civilised countryside, under complete cultivation, where large areas bear the marks of man's systematising influence, is an artificial state, resulting from the number, proximity and permanence of the settlements which man has been able to establish. If permanent establishments are either lacking or infrequent, there is quite a different ordering of the landscape. Vegetation is differently distributed. There are breaks in continuity or open spaces, depending on the nature of the place, and occasional stretches of poor soil which have never been improved. The last-named fact has been mentioned by every observer in tropical Africa.

Complex Conditions in Countries of Long-established Settlement. But as soon as one begins to analyze, to distinguish different types of establishment in relation to natural conditions and modes of life, regions of long-established settlement are the most difficult to observe because of their complexity.

The countryside in France, for example, or in central Europe, is a peculiarly composite picture, made up of a variety of incongruous details. Forms which are the expression of social and sometimes even

ethnic differences are found side by side. The factory is built beside the rural homestead, the château beside the farm. Why is a Flemish house next to a Walloon farm, an Alsatian village next to one characteristic of Lorraine? There are various conflicting influences, among which ethnic tradition is not hard to recognise. It is obvious how careful any analysis should be, and how many delicate shades of difference must be taken into account. But this very complexity teaches its own lesson.

On the historic soil of Europe human establishments have succeeded in altering natural conditions more thoroughly and more universally than elsewhere. A few landmarks make it possible to retrace their history, which is nowhere more rich or more varied. From the shores of the Mediterranean to central Europe and even to northern Scandinavia and the plains of Russia, a sequence of events, like an enveloping wave, has swept across regions of most diverse soil and climate. One by one heights encircling the Mediterranean basin have been terraced; low-lying plains around the Alps have been drained, while the Alps themselves have been exploited for pastoral purposes even at great heights. After the deciduous forests of central Europe had been cleared the marshes of glaciated areas were tackled. Lastly, the coniferous forests on the gravelly soils of northern Russia were overtaken by the wave of progress. For each conquest, — whether of slope, forest or swamp, — meant new agricultural methods, often

systematic in character, and special types of rural economy.

Doubtless there are regions whose culture is no less ancient than that of Europe; but it is not so varied. In China as in Japan, even in India, there has been no methodical attack on new agricultural areas. It has been sufficient to make the best use of those which had been cultivated since time immemorial. Human establishments continue to be confined to particular zones: mountain and plain are two separate domains. No Chinese, Annamese or Hindu builds in mountains, which are insalubrious and harbour hostile primitive societies. Mountains have usually played a passive rôle; they have been exploited for the benefit of the plains. They have had no part in the transformations wrought by the vital processes of evolution upon human activity. In this regard Europe is the most humanised part of the earth. No other presents so rich a field, with such a hierachy of types. The American system has different foundations. There have been no progressive stages of development. Villages doubtless exist in the parts of the United States which were settled first. But present means of transportation, marts supplied with all sorts of merchandise and the habit of changing agricultural produce into bank notes, take from the village much of its *raison d'être*. Rural communities are oriented toward the city, usually toward very large cities. And it is the city which controls the relations between rural communities.

Type Establishments. Are there no type establishments in ancient countries which can be defined and classified?

It should be noted at the outset that types, whatever they are, do not occur singly. With the exception of mining camps in the forest or in the heart of the mountains, types are distributed in groups, or, to a certain extent, in families of groups. If scattered settlement is the rule, the houses, farms or hamlets are numbered not by tens but by hundreds. The soil is studded with dwellings. If, on the contrary, clustered villages prevail, they are distributed in such a way that, provided there is a fairly wide outlook, several belfries can always be seen at once. Many French proverbs bear witness to this fact. Even cities have a tendency to multiply and to crowd into certain areas, as if they held an attraction for one another. So, except for occasional examples which are not typical, it seems as if, in a given locality, vast numbers of identical copies had been struck off. On this account it may be said that the site in part determines the dwelling, that among the traits characteristic of a region, giving it a peculiar cachet, the habitation is by no means negligible. In France, for instance, a traveller going from the district of Caux to that of Bray, from Brie to Beauce, from the latter to Perche, gains this impression most vividly. Richthofen expresses the same idea no less clearly in his description of the differences between the various provinces of China, — differences as great

with respect to manner of grouping as to shape of dwelling.

Nothing could be more natural, if one stops to think about it. Similar conditions of soil, hydrography and climate would tend to make a given type of settlement, once established in a region, the dominant one, because of the necessity which the inhabitants would feel of living together in harmony. It is a case of mutual adjustment. The numerous daily relationships which grow up between inhabitants of the same region do not admit of any departure from the manner of grouping and housing characteristic of the prevailing mode of life. This was particularly true in the past. In countries where cereals are cultivated on a large scale, the need of labour at the same seasons, together with the fact that the same thoroughfares had to be used by all, required a similar grouping, so that the areas which needed to be cultivated might be reached at the proper time. Payment being made in kind, the house of the labourer as well as that of the farmer or proprietor had to be built with a view to what it was to contain. On the other hand, in localities where the soil was parcelled out in separate enclosures, fields and pastures alternating, — "little countries," as they are called by the natives, — each farm had to be isolated, not only in order to provide for the necessary diversity of crops, but also to make sure of a strategic position in the network of paths. The law of mutual adjustment is especially rigid in

irrigated districts. There, everything is subordinate to the life-giving element to such a degree that there can be no manner of grouping, no arrangement of buildings other than that providing for the common enjoyment of water, whether of ponds or streams. Indeed, nothing could be more uniform than the *baracas* along the *huerta* of Valencia, or than the countless little huts in Upper Egypt, or than the villages encircling the paddy-fields of Tonkin.

And so it is obvious that villages come in series. It is these which should be recognised and studied, — not the exceptions. For only the series have geographical value.

Influence of Roads. Most authors who have written about human establishments have emphasised the importance of roads. This is because they had cities specially in mind. Highways, or rather, commerce and politics, have created cities. But such is not the case where more modest establishments are involved. For they have exploited the soil in a thousand different ways. Meitzen has proved this to be the case as far as the ancient village communities of central Europe are concerned. There is evidence of it all about us. The countless little hamlets in the southern part of the Massif Central, the adjoining though isolated farms of the basin of Rennes, the rural houses in wooded regions, — all are connected with the road-system only by paths, mostly useless because of mud. In Brie, the farms, though centres of great rural activity, are distributed quite

independently of roads; they communicate with one another by means of a network of little paths. In Limagne, small-scale farming begrudges space even for a few grassy paths. In Beauce there are highways, but no paths.

This does not mean that roads are not capable of creating villages. Topographic nomenclature bears witness to the fact that they do. At the present time in countries of scattered population such as Flanders or the valley of the Loire, houses are obediently lined up along the roads, thus forming actual streets and giving a half-urban appearance to certain countrysides. But how many regions there are (Morvan, Vendée, Sidobre) in which the highway never gives rise to any establishment whatever!

Rural districts are satisfied with a rudimentary system of roads subject to the whims of the seasons, fit only for pedestrians or beasts of burden. In eastern France and the agricultural plains of Germany, as well as in England, there are still vestiges of a type of organisation as ancient as the triennial rotation of crops, one which is manifestly independent of roads. From a nucleus of farmhouses, the fields, under a system of communal rotation, extend in long parallel bands, so that sowing, tilling, harvesting and consignment to pasture succeed one another in regular sequence and are completed simultaneously. Originally there were village streets between them in the form of narrow strips, either grass-covered, or lying fallow for the convenience of the peasant. This lo-

cal system of communications although less common today, is characteristic of a village community. It is sufficient unto itself. Roads may have been added later in order to communicate with the external world; but the social unit, the cell, so organised as to be self-supporting, had in this way already provided for its own circulation.

Since it is remote from roads the rural group must provide for its own needs.

In arid or desert regions, occupation is limited by nature to a narrow zone from which it cannot depart. Water is an inexorable determinant; no establishment can exist far from it, nor outside the oasis. But in the temperate zone there is more leeway, for sites may be chosen with various ends in view. The sum-total of human needs is, after all, only the following, — a certain amount of variety in food-supply, sufficient water, pasturage for domestic animals, fuel and building materials, and a salubrious soil.

The problem is always solved in such a way as to concentrate the necessities of life as much as possible. This fact explains the permanence of human communities in countries of long-established settlement. There is a systematic combination in the lay-out of ancient English villages, three distinct tracts surrounding the settlement: (1) cultivated fields, (2) meadow grounds, (3) pasture lands.

Lines of Contact. A mature landscape in which the angle of slopes does not exceed that practicable for transportation and circulation in general, but

which in addition to the advantage of different exposures has a variety of soils as well, — such are some of the conditions which attract and determine the location of rural establishments. In France, particularly in the Paris Basin, our hillsides abound in just such sites. Erosion is sufficiently advanced so that landslides have enriched the soil on the slopes and lessened the grade, — but not sufficiently to endanger the stability of the soil. The undisturbed lower strata form even bands, a regular sequence of unequally resistant zones, limestones or marls, lying upon sands and friable material, the line of contact marked by surface springs. To this harmonious combination corresponds a surface distribution of meadows, crops, orchards, thickets, woodlands, or small game preserves, such that the needs of the community can be satisfied in the vicinity. A single glance is sufficient to give a picture not only of the even, regular series of superposed agricultural zones, but of the village and belfry as well. In Noyonnais, upon the slopes of limestone hills capped with woods, isolated by erosive action, or in the vicinity of Saint-Gobain and Laon, cultivated land reaches up to the contact of detritus with clayey bottomlands; establishments, obedient to such a linear distribution, form a band around each group of hills. The soft chalk hills of Sénonais have an appreciably concave erosion profile, whose curve is accentuated by a long ribbon of fields. On the steeper slopes of Jurassic limestone in Burgundy or in Lorraine, there

is a succession of meadows, fields, orchards and forests reaching from base to summit, accentuating every difference, however slight, of soil, climate or hydrography, — all within about one hundred metres of altitude. This telescoping of the different zones makes a favourable location for human establishments. They are bound together by virtue of the give and take between the several varieties of farm activity. The choice of location indicates the best and most useful combination possible.

Each change in topography thus gives new and favourable opportunity for settlement. There is a marked tendency to converge, even to concentrate, at the angle of slopes, at the intersection of different gradients. This natural law may be verified in various localities, even in those where villages are not confined by lack of water, as is the case on certain limestone plateaus, to the level of springs or to the vicinity of streams. The plateaus of travertine and millstone grit in Brie, where water is plentiful and where great farms prevail in the interior, are skirted along the edges by a coronet of villages, which bend over the orchards on one side, leaning back upon the fields on the other.

Other examples from south and west come to mind. In the plain of the Po, in Emilia, Lombardy and Piedmont, the country swarms with rural habitations, at intervals for the most part of barely five hundred metres. Nothing in particular indicates the proximity of such large buildings, — neither trees,

nor gardens, hardly so much as a few little kitchen-gardens. They are lost in the immensity of the whole. For the labour of the inhabitants has turned the entire plain into one great garden, whose crops are protected from the rays of the sun by a curtain of trees garlanded with vines. But on the hills of Montferrat villages appear once more, crowning the summits with their belfries and with their ancient towers.

In Lauraguais of Languedoc the impermeable soil helps to bring about dispersal, with *bordes* (small estates) as the unit. But along the edges of valleys in those gravelly plateaus, there is a succession of towns or villages, mostly very ancient, recognisable from afar by lines of windmills. A similar sight impresses the traveller following the Loire between Chalonnes and Ancenis, where, on the left bank, between Saint-Florent and Liré, the slopes of the district of Mauges bristle with belfries and windmills succeeding one another at brief intervals. Behind this illusory village façade, one discovers, if one scales it, merely rounded hilltops studded with farms embowered in trees.

A growth of settlements marks the edge of the loess plateaus in Alsace between Strassburg and Saverne, as in Austria it marks the edge of the plateaus skirted by the Morova north of Vienna. Vineyards and orchards supplement fields of grain. The fact is that in this case as in the preceding, a gradual talus slope, the result of landslides, smoothes over the

different sections of slope. This whole arrangement is so familiar that it has moulded custom. It seems as if with the instinctive need for a combination of crops, some such type as this must have been in the minds of our French peasants when they transplanted that exotic growth, the agricultural village, to America. Their homes on the terraces along the banks of the St. Lawrence River, while near to one another, are not adjacent. Their rectangular strips of apple-orchards, oat-fields, meadows enclosed by wooden fences, lie between the forest above and the steep river-bank.

It may be stated as a general principle that human establishments preferably select lines of contact between different geological formations. The line of contact between oölithic limestones overlying lower Jurassic marls, so common in Burgundy and in Lorraine, was one of the earliest and most thickly settled of such areas. The famous site of Alise-Sainte-Reine might be considered typical. The Parisian Eocene, — either between layers of limestone and sand, or between gypsums and green clays, — has been sought out by villages upon the slopes along the Seine, the Marne and the Oise. The edges of the basalt flows which overlie clay slopes in Auvergne are bordered by villages, of which Royat is typical.

Establishments choose preferably either the upper level, as we have seen, or the lower level. Along the limestone *côtes* of the Meuse there is no dearth of towns at the summit, but the opulent, flourishing

villages in close succession are more particularly at the foot, all facing east. The same distribution is characteristic of the vineyard towns of Burgundy.

Villages in Series. The number and proximity of the establishments clustered along such lines of contact are a vital commentary on the force of attraction which holds them together. Nothing could be more striking than these rows of villages, which in certain localities seem to be born of the same need, drawing sustenance from the same life-fluid. A glance shows how they succeed one another at the same level in an almost continuous line, upon the slopes of Noyon and of Saint-Gobain, or along the steep limestone river-banks of the Oise. At the foot of the *côtes* of the Meuse, between Neufchâteau and Vaucouleurs, villages are also lined up, similar and sometimes related to one another: "Domrémy de Greux," Joan of Arc called her native village, which she did not distinguish from the older, neighbouring village.

Here are veritable axes of crystallisation where conditions are particularly favourable. Human establishments have felt their attraction and have concentrated in such places like corals whose colonies do not extend outside of certain zones. Because they are so close together they are mutually dependent, finding the proximity a guarantee of safety in time of trouble. There are like instances in other countries, notably in Germany, — at the foot of the limestone plateaus in Swabia, along the Odenwald, skirting the *Bergstrasse*, and elsewhere. A large part

of our population has lived upon the interdependence of such connected villages, which form social groups among themselves.

Mountain Types. In the mountains axes of crystallisation are not so common. The scattered type of occupation prevails. In the Franco-Piedmontese Alps, groups of hamlets rather than actual villages are the rule. Yet there are some clearly marked lines of occupation. They correspond to zones of vegetation determined by altitude. On the sides of what in the Vosges are called "hills," houses are confined to an agricultural zone about a hundred to a hundred and fifty metres above the lower meadows, well above fogs on slopes which the sun's rays are slow in reaching. The lower boundary of the chestnut zone next above that of vineyards, in the hills of Vivarais and part of the Cévennes, is a well-marked line of occupation. The same is true of Tessin. In Corsica the line of contact between the zone of the olive and that of the chestnut is preferred. In the mountains of Cantal, large villages occur at an altitude of about eight hundred to nine hundred metres, above the cultivated fields, near forests and pasture lands. In the Jura there is one series of settlements along the upper boundary of vineyards and orchards, and one along that of cereal cultivation. Levels of occupation coincide with certain contour-lines: in the French Alps the eight hundred metre contour is marked by various types of establishments. It is the boundary between the zone

which is chiefly agricultural and that which becomes increasingly pastoral.

But other causes, such as degree of erosive force, contrast between humid valleys and dry, luminous uplands, orientation, and exposure to air-currents, increase the number of possible village sites. In the agricultural zone the hamlets or villages seek out sunny slopes, mountain-spurs, terraces at different levels rarely reached by fogs, moraines and alluvial fans radiating from the outlets of lateral valleys. But the pastoral life typical of the Alps depends upon an intimate relationship between hay-producing meadows below and high pastures above, called "*les montagnes.*" Permanent establishments tend to locate toward the upper valley-heads, within reach of pasturage and not far from the forest. Above them is a mounting tide of chalets, *casere* or temporary dwellings, sometimes a few hundred metres apart, but often congregated in small groups. They are sometimes built of wood, sometimes of wood and stone.

In short, whatever makes for variety of landscape, whatever makes it easier to foregather, has its influence on the distribution of establishments. In the mountains, slopes of moraines and alluvial fans are favourite sites for hamlets or villages. Along lake shores, lines of dunes are skirted by buildings upon their slopes. In the river-plains of France, the terraces which were the banks of ancient streams are

adorned with houses or villages. Isolated hillocks in the swampy regions of the *Marschen* or *Polders* of Prussia were the sites of the earliest settlements. In Finland, stony ridges (*osar*) between clayey depressions have a magnetic attraction. In the Sahara, mountain massifs (Aïr, Haggar), cloud-condensers as they are, are the only sites suitable for permanent occupancy.

Thus it is clear that in all climates, though in varying degrees, every surface irregularity introduces a new element, which, — by virtue of orientation, exposure to climatic influences, or nature of soil, — furnishes man with the welcome opportunity of having within reach food, shelter and the chance for a permanent home. In this way he can acquire property and increase his wealth.

Caution and prudence have little weight. In the mountains, the sites chosen may or may not be loose, unstable soil, alluvial fans, even sites exposed to landslides. The proximity of volcanoes has attracted, never repelled. In seismic regions, mellow, friable soils, which are most exposed, are also the most densely populated.

II. CLUSTERED SETTLEMENT; FARMS AND VILLAGES

Two types of establishment, belonging to the same family, are characteristic of agricultural life on the open plains of central and western Europe. One is the village, the other the farm or *hof*, very different in size and general arrangement from the *borde* of

Languedoc and the *mas* of Provence. The similarity between the two types of rural establishment is a result of the similarity between the modes of life of which they are expressions. It is inherent, a result of their origins. The *vicus* clustered about the *villa*, just as today the Bulgarian village clusters about the Turkish *shiflik*.[2]

The Farm. The farm is a unit from the point of view of implements, barns, live stock and labourers living on it. In size and regular arrangement it suits the wide agricultural plains. It is a familiar element. North of the Loire it most often takes the form of a square or rectangular enclosure surrounding a court, dwelling and stables with exit through the barn. It is probably the type most closely resembling the ancient Gallo-Roman villa.[3] This type is not peculiar to Picard and Walloon countrysides; it occurs also, although smaller in size, upon the loess plains of Austria between Linz and Vienna. Is it not exactly the sort of establishment best suited to take care of the large stock of implements and numerous personnel required for cultivation of cereals on a large scale?

The arrangement of farm buildings characteristic of the district of Caux suggests such occupations as arboriculture and stock-breeding. There are many

[2] C. Jireček, *Das Fürstentum Bulgarien*, Prag u. Wien, 1891.

[3] Musée du Cinquantenaire de Bruxelles; excavations of the Archeological Society of Namur at Sauvenière; plan of the foundations of a farm of the second century A.D.

separate structures all, however, within a rectangular enclosure where pastures planted with apple-trees are surrounded by a ditch shaded by beech-trees, — a dark spot appearing at almost regular intervals through the veiled mists of the plateau. On the borders of Artois as well as in Denmark and elsewhere, the farm consists of three tall buildings enclosing a court, surrounded by trees and orchards.

Detailed analysis is not necessary. But it is important to notice the fixed character of the different types, their uniformity within a given area, also their number, — proofs of how perfectly adapted they are to a certain mode of life.

A farm may be located between villages or within one. For instance, on the plains near Paris, either on entering a village, or on its outskirts, there may be a structure which, — by its expanse of bare walls, high, broad portal opening into an interior court with pool and large trees at the entrance, — is different in appearance from other houses in the vicinity. But it depends on the locality whether farm or clustered village predominates, without its being always easy to discover why it should be one rather than the other. Certainly surface water has a good deal to do with it. That is the reason why the farm is characteristic of the impermeable millstones of Brie, and is of frequent occurrence, as in the district of Caux, on loamy soil where pools form easily, while it is second in importance, not to say scarce, on the permeable chalks of Picardy, Champagne or

on the plateaus of *Muschelkalk* in Lorraine. But doubtless other elements, historical or ethnographical, should be considered if one were to discuss this subject more fully.

The Village. The village characteristic of great agricultural plains, such as it exists in France, in central Europe, in the plains of the Lower Danube and in Little Russia, is a systematic expression of a mode of life. How commonly it occurs in areas bare by nature or easily cleared is shown not only by a glance at the map, but is perfectly apparent in real life. In the districts of Santerre, Artois, Cambrésis, etc., in the Kochersberg between Saverne and Strassburg, in the Hellweg between Unna and Soest, and in the Börde of Magdeburg west of the Elbe, villages identical in appearance are placed as if on a checker-board, within easy reach of one another. Their distribution is less regular in Champagne where they crowd along streams, or on the plateau of Lorraine, where they seem to prefer depressions, or in Soissonnais, where they skirt the edge of limestone plateaus. In spite of differences due to climatic or to historical causes all these establishments are related in origin; their vitality comes from the same sources. They developed in groups.[4] They are like plant associations. Names often reveal this relationship; for instance, such and such a village, doubtless

[4] In Normandy, settlements ending in "ville" had taken the place of villages destroyed by the Viking invasions (Ch. Joret, *Des caractères et de l'extension du patois normand*, Paris, 1883).

the older, has a counterpart not far off whose name is a diminutive form of the first.[5]

These types of establishment derive their permanence from their adaptation to the soils and climates typical of certain parts of Europe.

These level plains which can be ploughed in long, unbroken furrows make up for uniformity by being adaptable to various agricultural combinations. Crops can be raised on a large scale by the same methods, with the same machinery and at the same seasons, — sowing, weeding, harvesting being carried on everywhere simultaneously. There is an entente, a mutual understanding, with the attendant advantages of economy of costs and complementary commodities. Such conditions have given rise to a systematic combination of crops and a practice of regular rotation. For a thousand years at least triennial rotation has been the custom here, for there are proofs of its existence as far back as the ninth century.[6] By common agreement cereals or leguminous plants have been combined with fallow-lands and pasture. But such an arrangement is consistent only with a type of occupation in which the entire space for living purposes is centralised, a focus from which all parcels are accessible and from which radiate the long bands intended for allotment. The clustered village with

[5] On a quadrangle of the Etat-Major map (Amiens, s.e.), we find: Achiet-le-Grand, and Achiet-le-Petit, Chuignes and Chuignolles, Ailly and Alliel, Lucheux and Luchuel.

[6] Alfred de Foville, *Enquête sur . . . l'habitation en France*, Vol. II, *Etude historique*, Jacques Flach, 1899, p. 41.

its concentric arrangement of different crops, toward which footways or grassy paths all converge, persists by virtue of its own inherent organisation, independent of any external cause.

Whatever is essential to the community as a whole is located near the houses, such as wells driven at common expense, a prime necessity for villages on permeable plateaus, or ponds and reservoirs in districts where the subsoil is impermeable, or orchards, enclosed pastures and clumps of trees. In the plains of Artois what is called the *plant* is an essential part of the village. In summer it is a green girdle of vegetable gardens, apple-orchards, and little fields enclosed by wire fences, enshrouding the houses which it protects, also the belfry, which often is all that can be seen of the village. Nothing could be more diversified than these *plants*, rural life in miniature; out beyond, a uniform expanse of fields and fallow-lands for flocks and herds which used to be more common than now. The village is the focus of all activity.

Modifications of the Landscape. Because of such combinations, the pattern as well as elements of the landscape have been modified. Around the houses there is a composite *ensemble* of trees and plants, while space allotted to crops is at a distance from the inhabited area. In western and central Europe this change has been brought about at the expense of the forest, while in eastern Europe it has been chiefly at the expense of the steppe.

A study of botanical geography shows that much of the surface of western and central Europe seems originally to have been covered with forests of deciduous trees, either continuous or with clearings here and there like a sort of park. It is but natural that traces of the earlier condition appear in the present landscape just as features of an adult suggest those of the child.

But there are certain regions where trees, if they ever did exist, have been almost completely exterminated. The chalky slopes between the valleys of the Aube, Suize and Marne in Champagne, or between the Ancre and the Somme in Picardy, are only a bare waste, with here and there a mill or lone tree as a point of reference. Even Beauce itself, without the rows of trees lining its highways, would be treeless except along its shady border. But more often, at least as far as northern France is concerned, a balance has been struck between original plant-cover and present vegetation. Though forests have to a large extent disappeared from the loamy plateaus they have taken refuge wherever cherty clay comes to the surface; or on sands which sometimes overlie the limestones in the Paris Basin and sometimes are overlain by them (Hurepoix, forest of Villers-Cotterets); or on the ancient alluvial gravels within the curving meanders of the Seine. The outcropping of cherty clays means a fringe of woodland along the valleys of Caux. Erosion has allowed them a foothold in certain spots where they have taken per-

manent root, and from which they still overflow to a certain extent in the form of wood-lots, hunting preserves, or brushwood. Such examples may be found between Vexin and the district of Caux; in Hurepoix between Paris and Beauce; in Picardy, on the borders of Ponthieu or Artois; between Valenciennes and Mons, and on the borders of Hainaut. In all these places bits of woodland, in which oak and beech predominate, seem still to be protesting by their vigorous growth against the mutilations of which they have been the victims. Elsewhere, it is still plain that they formerly covered the entire surface, — for instance, an almost unbroken girdle of woods encircles the plateau of Pévèle where agriculture is practised on a large scale. Remnants of forests seem to reach out toward one another in Arrouaise near the border of Vermandois and Artois. Even on certain plains where large-scale agriculture is the rule, one gains somehow an impression of an all-pervasive forest. In Brie, — ancient Saltus, — there is a profusion of large trees between the cultivated areas. Where the loamy surface-layers, thicker on the convex tops of the hills, thin out toward the edges, forests gain once more the ascendency; this is particularly the case in Caux. A strip of forests, brush or moors, intervenes between the population of the valleys, which is chiefly industrial, and the largely agricultural population on the plateaus. At some distance from the valley-walls, on the slightly undulating surface of the plateau, farms and large

villages abound, and if the space between two valleys is very limited, the villages seem to be pinched between two strips of forest.

That forest originally covered most of these plains, and that it has given way but grudgingly and half-heartedly to encroachments from without, is proved, particularly on the limestone plateau of Lorraine, by the vigourous, impenetrable growth of underbrush. The remnants of forests of oak and hornbeam, whose regular and geometrical shapes are picked out here and there with dark shadows upon the surface of the stubble, maintain, if only in reserve, a sturdy air of hardihood, proof of the strength which they derive from the climate and from the soil.

Influence of the Continental Climate. On the other hand, trees seem intrusive on the Hungarian *puszta* and on the plateaus of Podolia and Little Russia, where cereal-harvests, often bordered by sunflowers, have taken the place of the billowy carpet of *Stipa pennata.* There, the wide spaces are occupied by crops and the only trees have been planted by man. That sheltered slopes are the forest's refuge is a fact brought out with greater clearness here than in the marine climate of western Europe. The same climatic conditions which were favourable to the growth of steppes in the past still prevail, though in modified form. They are adverse so far as forest-growth is concerned. Such, for instance are the icy northeast winds bringing late spring frosts which abruptly follow periods of early heat. Pla-

teaus which are inhospitable to forests are equally so to man. The extremes of temperature in eastern Europe require attention to the same sort of problems as in mountains, — that is, necessary shelter for commodities and for the tender crops so important to mankind. The fertile plateaus of Podolia often present the spectacle of cultivated land stretching farther than the eye can reach without a single village. The latter nestle on slopes or at the head of tributary valleys or within the deeply incised meanders of the Dniester, Strypa or Sereth. Still more significant is the distribution of villages in the black-earth belt of Russia. They are always located either at the head of lateral ravines, or on river terraces. And if watercourses are an insufficient source of supply, artificial dams, — indispensable to these villages as tanks to the cities of southern India, — supply ritualistic and domestic uses by providing permanent reservoirs.

And so the population of the black-earth belt is distributed in large villages whose houses are not scattered at random but are lined up in a row. The axis of the village consists of a single wide street. With living quarters on one side, the farm buildings complete a square surrounding a farmyard. Toward the north, at about the fifty-third parallel, near the edge of the better-watered forested area, the villages begin gradually to scatter, to withdraw from the streams, and, with the cleared land surrounding them, to form oases which become smaller and smaller in the immensity of forest. Between 50° and

55° north the transition is complete, but it appears more in manner of building than in the form of the villages. The wooden house has replaced the house of stone, the wooden roof the roof of thatch, but the general arrangement is the same. The village-type consisting of a single wide street remains as characteristic of the Muscovite district as it was of the black-earth belt. Uniformity of plan persists as external evidence of similarity of organisation.

Conclusion. Are we not already in a position to make certain generalisations as a result of the above observations?

Wherever broad plains have a relatively uniform soil and relief the clustered village, — or establishments which resemble it as to number of occupants, — is the rule. This is true not only of Europe, but of China as well. With reference to villages in the loess country Richthofen says, "They are groups of families, united by common descent, or at least having rites in common, who cleave to one another because of the necessity for coöperating in the cultivation of the same crops." [7] In addition to China, another illustration comes from the Indo-Gangetic plain, not including the delta of Bengal, where one of the most perfect types of village community has developed and become firmly entrenched.

All such establishments, though different in form, — a fact due to climatic differences or to different stages of social development, — are an expression of

[7] *China*, II, p. 680.

the same need. That need is to centralise agricultural activity in some one place. A coöperative agreement as to dates in the agricultural calendar, and the time for certain tasks, is adopted for the advantage of all concerned. Necessity for coöperation in the regulation and control of water, driving of wells, upkeep of certain public works and preparation of the environment to make it favourable to crops, — such things mean consolidation. The village is a distinct, separate organism, with its own individual life and a personality which forms part of the landscape. Concentration of living-quarters is necessitated by the diversity of parcels to be cultivated, because their only common meeting-ground is the village, whither all paths lead.

Thus constituted, the village can furnish a market and encourage rural industries, just as requirements of industrial agriculture have connected factory with farm in Little Russia, in the plains of Germany and in northern France.

III. SCATTERED SETTLEMENT

Human establishments have not everywhere had the same inducements to collect in groups. Where a diffusion of waters, variety of exposure and fine dissection of the landscape occur together, there are all the necessities for a permanent abode. So the groups consist of the members of a single family, with possibly a few neighbours in addition. There

is nothing to require the varied services which life in a village community implies. Habitations scatter.

The scattered type of settlement is found in France in different forms, but with sufficiently marked regional characteristics so that the boundaries of each can be roughly determined. Sometimes it is the small isolated farm almost hidden by trees, connected with other farms a few hundred metres distant, by shady, muddy paths. This is a frequent type in Brittany and western France. Elsewhere, in Cotentin, for instance, two or three farms form the unit. Somewhat crowded hamlets consisting of a dozen firesides or so is a frequent type in much of the Massif Central. Groups of separate houses form what is called a *quartier* in the Basque country.

Isolated houses or hamlets are tiny foci, incapable of exerting any attraction comparable to that which centralises cultivated fields about the clustered villages on great plains. In its large aspects the appearance of the landscape resulting from such forms of establishment, is characteristic of an entirely different type of agriculture, of another mode of life, and of a totally different arrangement from that of clustered villages.

Centrifugal takes the place of centripetal. Everything spells isolation and privacy, — lines of trees zigzag across the landscape and reach over the hills, their tops, in strange silhouette, jealously dividing fields and closes. Rarely is much space allotted to a single crop. Usually the tiny fields, each different

from the others, are enclosed by hedge-rows. There are moors among the crops. Sometimes the same close serves for crops and pasturage in turn. Instead of uniform plains crossed at rare intervals by highways, there are multitudes of dugways, ditches and embankments adorned with trees and bushes. This chopping up of the landscape rarely admits of a view of the whole. If, by chance, a higher point is reached, from it only a thickly wooded country is to be seen, whose slopes and hilltops all look alike, and the paths rambling here and there are indistinguishable from one another. The impression gained from such a landscape is one of isolation, and the stranger finds himself ill at ease in the labyrinth which to him seems inhospitable, even hostile. In this type of settlement the only centres of activity are where meetings are held periodically, — at markets, churches, chapels, assemblies and social gatherings.

Here we have an example of backward and undeveloped community life. But that this mode of life is deeply rooted, that it is as much a matter of environment as of manners and customs, is shown by its tenacity, and its prevalence in localities to which it is well adapted, — for instance, its connexion, permanent perhaps, with the institutions and the social conceptions of certain races.

The framework of social life as well as the appearance of the landscape, serve to bring out the difference between areas whose inhabitants live in clus-

tered villages and those where solitude is unbroken except on certain days.

The contrast between these two types of settlement is naturally not peculiar to France, though it is perhaps not so marked elsewhere. It is characteristic of Swabia.[8] While the clustered village is typical of the limestone plains of the Middle Neckar and the plateaus of the Rauhe-Alp, the scattered type (*Einödhof*) occupies a distinct and well-defined area in the morainic region north of Lake Constance and the Allgäu. The same physical causes as those pointed out above seem to be effective here also, finely dissected topography, abundance of springs, diffusion of waters, all have favoured small independent units, each a centre of agricultural activity. And this type of exploitation means that fields and pastures dovetail, evidence of a type of life which continues to be semi-agricultural and semi-pastoral.

Nowhere in Europe is this scattered type of occupation shown on a larger scale, nowhere has it a more markedly archaic character than in the Balkan peninsula. Scattered settlement and clustered settlement, hamlet type and village type, there actually seem to correspond to geographical differences. In Serbia, as well as in Bulgaria, the rugged and mountainous sections seem the natural habitat of scattered settlement,[9] — slopes and declivities rather than

[8] R. Gradmann, *Die ländlichen Siedlungsformen Württembergs, Pet. Mitt.*, 1910, 56, I, pp. 183–186.

[9] Constantine Porphyrogenitus wrote regarding these people, that "they cannot endure having two cabins near one another."

plains and valleys. But houses in groups of a dozen, or even more, whose occupants are usually connected by family ties, are more characteristic than the isolated farmhouse. The dwelling is thus a reflection of the social state. Cvijic has tried to draw a boundary, vague though it is, between clustered villages and scattered hamlets [10] along the frontiers of ancient Serbia and Bulgaria between Kumanovo and Kostendil. In Bulgaria also these hamlets, called *kolibé*, seem to be the dominant type in hills and mountains.[11] They are the characteristic mode of occupation, in marked contrast to the plains villages. The same contrast obtains in Wallachia; the *catun*, or hamlet of three, four, five or more houses, is characteristic of hills and foothills, as the village is of the plains. "There is water everywhere, a rivulet or spring in every hollow. The forest, depleted though it has been, is still close enough to supply the timber necessary for building purposes and for winter fires." [12] North of the Carpathians there is the same contrast, — hamlets in the hills and large villages on the plains of Galicia and Podolia.

Too many complex questions of race are involved, and too many changes of the economic order, for this

[10] J. Cvijić, *Grundlinien der Geographie und Geologie von Mazedonien und Altserbien* (*Pet. Mitt.*, *Ergänzungsheft*, No. 162, 1908), p. 125.

[11] Jireček says that the *kolibari* were originally shepherds who also practised a little agriculture. (*Bulgarien*, *opus cit.*, p. 149.)

[12] Em. de Martonne, *La Valachie*, Paris, 1902, p. 249.

delimitation on a geographical basis to remain absolutely unchallenged. Various causes tend to modify it; agricultural pursuits may be more important than pastoral. But the distinction remains. In the Balkan peninsula which has had such a troubled history, and where there has been such a fusion of races, the distinction is an expression of natural conditions: it continues to be a living witness to the antiquity of modes of life which are a spontaneous outgrowth of the environment.

IV. SUBTROPICAL AND SUBARCTIC TYPES

Toward poles or toward equator, zones suitable for human occupation gradually dwindle, — sometimes because of too much humidity, more often because of too little. Nor are these the only causes involved.

Subarctic Regions. In north European Russia, at about latitude 58°, near the boundary between deciduous and coniferous forests, marked differences, unknown in the temperate zone, begin to appear between inhabited areas and those repellent to human occupation. In the region of the upper Volga, — a domain of the Finnish Cheremiss hardly touched by Russian influence, — there is a marked contrast between highlands whose loose soil, covered with a layer of black-earth, has favoured agricultural clearings, and lowlands where the still almost continuous forests of pines and firs are unbroken save for lakes and marshes. The village, prosperous, surrounded

by orchards and thick clumps of lindens, birches and alders, has become well established in the highlands. In the lowlands it exists only in rudimentary form, "and has no trace of vegetation around the buildings." [13] Stagnant water with attendant frosts and fevers is obviously the deterrent.

In the Baltic Provinces, as well as throughout Scandinavia in general, isolated farms are prevalent wherever the flat surface of the plain gives way to the choppy appearance characteristic of glaciated regions.

North of the sixtieth parallel Finland has been the site of a more aggressive colonisation. There, perhaps, man has made a supreme effort to fit an inhospitable region to his needs. Scraped bare by glaciers or strewn with their deposits, its surface is cut up by "a succession of rocky hillocks, gravel banks, lakes and clay fields into a multitude of small districts." [14] This dissection of the landscape, in Finland as well as in regions where it is the result of other causes, has produced the usual effect: it has been hostile to village growth, while favourable to that of hamlets and isolated farms (*torp*). Pioneer colonists on the lower plateau have even been impelled by a sort of centrifugal force to settle as far apart as possible, just as they did later in the American Far West,

[13] J. N. Smirnov (translated by P. Boyer), *Les populations finnoises des bassins de la Volga et de la Kama*, Paris, 1898, p. 81 *et seq.*

[14] *Atlas de Finlande:* map 2; text p. 20 (J. J. Sederholm).

because it was the only way to combine the meagre resources of fishing and hunting with very limited agriculture. Little by little, it is true, with the progress of drainage a wider margin has become available for human occupation. East of the lacustrine plateau, it was customary to build here and there on the sand and gravel hills, only moderately fertile, to be sure, but less exposed to frost than the clay soil or the peat-bogs of the valley-bottoms.[15] Sporadic groups of houses sprang up, but became real centres only along the streams.[16] In solitudes oppressive with stagnant waters and marshes and silent forests of birches and evergreens, where agriculture exists on sufferance as a result of clearing and burning, flowing streams mean life and movement. And it is along the rivers that human establishments have prospered. A fringe of settlements follows the water courses, especially in the eastern districts where the evolution of river-systems is more advanced. These establishments are strung along the banks, rather than concentrated in any one spot. There is a striking similarity to French mountains, where each river-valley forms a separate province.[17] And so the distribution of establishments is in harmony with the physical forces which are working to establish a coördinated river-system in place of the laby-

[15] *Atlas de Finlande:* map 12; text p. 20.

[16] *Atlas de Finlande:* map 26. *Population dans les communes rurales répartie par villages.* (Each dot represents ten inhabitants.)

[17] *Atlas de Finlande:* map 14; text, p. 43.

rinth of lakes and swamps which is a heritage from early Quaternary glaciers.

China. The uniform character of the soil in North China is favourable to groups. Some do not exceed the proportions of hamlets, while others are large clustered villages. In the valley of the Wei River they are hamlets, consisting of a certain number of cube-like dwellings enclosed by a wall of earth, rather than large closed villages. The more typical village is found in the province of Shantung, an inherent part of the ancient civilisation which has survived there better than elsewhere.

With its temples overshadowed by great trees, and its portraits embellished with mouldings and inscriptions carved in stone, it is often the embodiment of the classic type which ancient Chinese paintings delighted to portray.

If one goes farther south, from Honan toward Hupeh, or from Shantung to Kiangsu between the two great rivers, — especially in Hunan and Chekiang south of the Yangtze, and in the rich western province, Szechwan, — the effects of a different climate and soil are apparent in the type of rural habitation. There is no loess to smooth over the roughness of the surface and spread a uniform colour over all things. A tendency toward diffusion becomes more and more marked, conforming more closely to the distribution of family groups. Sometimes the dwelling follows the tea-gardens up to the top of the slopes, sometimes it is built on land relatively too

high to obtain the necessary water in summer for the cultivation of rice. It is situated above the terraces just as the Mediterranean village is situated above the orchard.[18] The compact little groups of houses are an expression of family solidarity as it is understood among this people, with all its ramifications, its numerous progeny closely united by beliefs and ceremonials, thus maintaining around the parents groups of thirty, forty, fifty or more individuals.[19] The seasonal labours of rice-culture and tea-gathering, because of this family collaboration take on a patriarchal character, of which house or group is the setting. It has more significance than our hamlets in France, being a more exact embodiment of the principles on which Chinese civilisation is founded.

Nowhere has this type of distribution developed more extensively than in the "red" basin, — the great, irrigated district of Szechwan, "a big garden belching men." Cultivation of orchards is carried on there with that of cereals and vegetables, rice, barley, wheat, beans, hemp, rape, etc., all closely crowding upon one another. Thick groves of orange, mulberry and coniferous trees, as well as bamboos, indicate where there are groups of houses. In a China so scarred by the destruction of forests, where the persecuted trees now have but few places of refuge, — around the temples, for instance, or the

[18] See fig. in E. Tiessen, *China*, Berlin, 1902, p. 339, farm above irrigated terraces in the upper valley of the Han.

[19] Richthofen, *Tagebücher*, I, p. 405.

family tombs which are so numerous in the essentially Chinese province of Honan, — bamboo hedgerows, poplars and mulberries about the farms of Szechwan, are often reminiscent of the forest which has disappeared.

But whatever the form of rural occupation, whether farm, hamlet or village, in China its area is limited, like the agricultural methods practised there. To plains and valleys, which are the favourite sites, man adds, with great difficulty, all the space he can by terracing the hillsides. But because there is no live stock the degree to which he can make use of the slopes is limited. This explains certain contrasts which give a false impression. The myriads of hamlets or villages which crowd into irrigated valleys or near river-mouths where the gradual decrease in slope and the regular rise and fall of tides facilitates water control, are often followed by wide uncultivated wastes. It has been pointed out that there are open spaces in arid or semi-arid districts along the shores of the Mediterranean; but their explanation does not hold here, because it is particularly in the well-watered regions of central and southern China where the unoccupied areas are most frequent, and establishments exist only in a most rudimentary form. A social fact, the result of long-established agricultural habits which focus all ingenuity and all effort on crops supplying the food, clothing and light to which Chinese society has become accustomed, — such is and such will remain, at least until a new

order, the cause of this curiously exclusive distribution, which bears no relation to any compulsion of physical requirements. It is the expression of an early stage of development perfected once for all and preserved by age-old isolation.

So far as the social system is concerned, we do not leave China when we enter Tonkin. The delta swarms with villages, close together, identical in appearance, — the characteristic mode of settlement. The site is determined by nature, a small area hemmed in by alluvial deposits.[20] Between the dykes built for the control of floods, there are little compartments in which water accumulates during the summer rains in *arroyos*, pools and ponds, artificial in part. And here the Annamese of the delta has built his village. With its mud houses, ponds, pools, little vegetable gardens, all enclosed within a hedge of bamboo in which there is here and there an opening for purposes of protection or defence, it is a unit in itself. The independence of this microcosm is guaranteed by pooling all the resources, whether of food-stuffs, of means of defence, of stores or of water-supply in case of drought. The setting is only in part artificial. The cisterns where rain-water collects, as in the *johls* of Bengal, are filled from the small pools lingering after summer rains and floods. By strengthening their borders, and controlling the flow, a precise and minute regulation is accomplished,

[20] E. Chassigneux, *L'irrigation dans le delta du Tonkin* (*Revue de Géog. Annuelle*, Vol. VI, 1912, fasc. I, p. 44).

entirely in keeping with the labour-supply, and the processes and implements of agriculture utilised by these little communities. The social unit on which Annamese society is founded finds adequate expression in such a setting as this, where it converts into small change the wealth brought by rivers in the form of ingots.

India. Except for the wide plateaus of central India where the most rudimentary forms of establishment still persist, India is, par excellence, a country of villages. The cities of this immense agglomeration of human beings contain but 2 per cent of the population, and rural occupation is chiefly in the form of villages. Hamlets or huts are characteristic only of Lower Bengal where little groups are dotted here and there among the bamboo hedgerows, and along the narrow coastal strip of Malabar and Travancore, — both regions where heavy rainfall and an abundant water-supply encourage scattered settlement.

On the other hand, a very compact type of village is characteristic of the Punjab. It has so many inhabitants, is so complete in itself with its organisation and its various trades, so well enclosed within its mud-walls, that it resembles a tribal camp. Between grassy slopes busy with stock-raising, markets and fairs (lowlands or *khadar*), the regulation of valley-floods by means of primitive sluices and the driving of wells near elevations, necessitates coöperation. A contact of different opposing types of life appears

in the manner of grouping. Establishments scatter and become more diffuse in the great plain of the Jumna and of the Ganges, as far as Allahabad and Benares. On approaching the vulnerable frontiers and the routes of invasions, the village no longer strictly adheres to the earlier community organisation. Groups are smaller. They are also closer together; the distance between them does not average as much as two kilometres.[21] The water-table is so accessible that these communities cover uniformly the entire area of loose mellow soil, bounded on the north by the *teraï* zone, and on the south by the sandstone cliffs of central India. The wells, either of masonry or of temporary construction, with which the surface of the *Doab* (the Mesopotamia of the Ganges) is honeycombed, — for they can be counted by hundreds of thousands, — are the anonymous and age-old work of tillers of the soil who lived in groups. Doubtless this mode of occupation in the upper and middle valley of the Ganges owes less to the dictates of nature than to a wish to remain closely united in order to strengthen the ties between traditionally different races. It is similar to the type of colonisation in the delta of Tonkin. These groups, though close together, live isolated and secluded lives in a traditional setting where artisans or agriculturists supply all necessities, even coveted luxuries, and which, once complete, do not easily

[21] *Census of India*, 1891, *General Report*, J. A. Baines, London, 1893, p. 53.

admit newcomers. No census has ever shown anywhere a larger number of individuals living in the same place where they were born.[22] Intermarriage does bring about some exchange of population between neighbouring villages. But that is the most that can be said. While a single village-type may have been encouraged by the easily cultivable, homogeneous soil, — it is equally true that the necessity of guarding against irregular and insufficient rainfall has been responsible for the maintenance of village groups.

The relation between irrigation and village-type is no less apparent in the interior of the Deccan, where it is also necessary to construct reservoirs to make up for insufficient rainfall. The underlying Archean rocks do not admit of much sinking of wells, as in the mellow soils of the Indo-Gangetic plains. But a few dams between broad undulations of this peneplaned surface suffice to form tanks or artificial reservoirs. There are as many as 43,000 such basins in the fourteen districts of the Madras Presidency alone, all of them of native construction. No village is without this essential organ, which is both the work of its hands and its *raison d'être*.

In southern as well as in northern India these anonymous structures preceded the great accomplishments of historic dynasties. Forerunners of the great canals of the Sindh and of the Ganges, or the monumental dykes of the Cauvery and the rivers of

[22] *Census*, 1901.

Carnatic, were the preliminary modest constructions and regulating apparatus conceived and executed on a scale commensurate with the size of villages or limited groups, and which only claimed to supply communities of two hundred to a thousand inhabitants.[23] So well adapted to conditions of soil and climate were they that, once established, the type has been repeated in almost unmodified form, till there are millions of examples both in Mysore and Carnatic and in the plain of the Ganges. In fact it has increased as much as conditions of soil have warranted.

V. CONCLUSION

Incomplete though this comparative survey may be, it does suggest a few remarks. There is something essentially geographical in the distribution of these different types of rural establishments which we have found in Europe, around the Mediterranean, in China, Tonkin and India, and which doubtless exist elsewhere. These examples demonstrate the fact that the type of distribution is determined by the region itself. It is not a matter of chance that the clustered village is found here, and scattered hamlets there, while elsewhere small houses or huts are dotted all over the landscape. And yet, it would be futile to pretend to make a general classification from geographical data alone. Only certain condi-

[23] See table of village populations, *Census*, 1891, *Gen. Report*, p. 49.

tions of soil and climate are compatible with the scattered or clustered type; others are incompatible. The scattered manner of grouping suits localities where, as a result of the dissection of relief, soil and hydrography, the arable land is itself divided up. The clustered village is indigenous, on the other hand, in districts where the arable area is continuous, admitting of uniform and extensive exploitation. Constrained by common needs, groups have been formed. The sinking and upkeep of wells, ponds and pools and the necessity of building walls, is a contributing cause to the crowding and concentrating of living quarters.

It would be vain to neglect the influence of the need for security and defense. At the contact of steppe and districts characterised by other modes of life, all structures take on the look of a fortress. Even the village, on the edge of the Sahara, Arabia, Turkestan and Mongolia, becomes a prison and a refuge. On the other hand, wherever after long periods of insecurity safety begins to dawn once more, there is a move toward diffusion. Bonds are loosed, as it were. From the ancient fortified village upon its mountain, forbidding in appearance, being gradually abandoned, groups of houses are let loose, like a troop of emancipated school-boys, scattering as fancy dictates.

But in the grouping of rural establishments, considerations of defense and protection are not paramount. The site is an expression of a combination

of physical influences, in which slope and level of water-table play a part, with an artificial association of crop-plants. These elements are combined differently, according as to whether the nucleus is a village, a hamlet or one or two isolated farms; but they are all the work of man. They modify the landscape profoundly, and form on that account one of the essential elements of human geography. Wide social differences have arisen because of differences of habitation. The village is the expression of a type of community larger than family or clan. Ancient village communities have a part to play in our old European societies, not to mention that which they still have in Russia. If they have ever lost this influence, it is because of the increasing importance of cities, the development of transportation and of commercial life, — which have given rise to new forms of life on all sides. Village industries have in large part died out in our country districts; modern industry locates according to new laws. But there are vast regions in which the village has long been and still remains the essential unit, — in India, Indo-China, and, at least in large part, in China. In India the village continues to provide for what everywhere else is the privilege of cities, namely, division of labour and the satisfaction of needs, even of luxuries. It is a little closed world, whose hold is so firm that it stifles every other community feeling and fills the horizon. "Because of the great variety of communal institutions," writes the mandarin Tran Than

Binh, "we Annamese imagine ourselves in China or in America as soon as we leave our village." [24]

And so the village, in those oriental countries, absorbs a larger and larger part of social life, to the detriment of more pretentious types of organisation such as cities or states. The contrast with Europe is marked; it seems more marked still with the United States of America. But this is all an inherent part of life which is moulded and adapted to circumstances. Lack of security, a state of piracy and war modify occupation in a more or less temporary way. No condition should be considered fixed and unchangeable. The bond which held the houses together in compact groups on the heights around the Mediterranean has loosed its hold. Group-types develop like everything else. It would be most interesting to trace this evolution, not only in Mediterranean countries, where it can be observed at the present time, and in recently settled areas like America and the temperate zones of the southern hemisphere, where it is just beginning, but also in tropical regions, and in the East and Far East where the population seems to have hardened in very ancient moulds. In isolation they have continued to exist. But perhaps they may not always resist the introduction of railways, big industry and the numerous innovations which result from contact with world commerce.

[24] H. Russier and H. Brenier, *L'Indochine française*, Paris, 1911, p. 136.

CHAPTER VI

THE EVOLUTION OF CIVILISATIONS

I. THE NATURAL TENDENCY TOWARD PERFECTION

Look at personal belongings of the Melanesians such as clothes, arms and ornaments in museum show-cases. The shells, teeth, bones, tortoise-shell, woods and vegetable fibres give you the impression of an equatorial coast environment. You recognise the feathers of multi-coloured jungle birds in decorative objects from Brazil, and in the ornaments of Kafir shepherds, rhinoceros hides and sinews of the hippopotamus. It is obvious that they are just so many instances of adaptation in direct response to the environment. Such environments have changed very little except as the result of fires or temporary destruction of forests. The vegetable and animal world remains in a state of nature. Furthermore, almost nothing has been brought from a distance.

Then glance about you; look at our highly civilised countries where fields, meadows and even forests are in part artificial, where our associates, animal as well as vegetable, are only those which we ourselves have chosen, and where products, implements, and raw materials are all more or less cosmopolitan. On the one hand you have civilisations frankly indigenous

and local; on the other, those in which the environment can be perceived only through a veil of complex heterogeneous elements. There seems to be an impassable gulf between rudimentary cultures, the expression of local environments, and our own superior civilisations, — end-products, as it were, the results of accumulated progress. The former are such an exact expression of their environment that they can neither be transferred nor can one imagine them elsewhere, whereas the latter can communicate with one another and are capable of expansion.

And yet each of these types of civilisation has the same roots. Societies have always begun to seek ways of satisfying their needs in the immediate vicinity. In their quest, most have given evidence of ingenuity and inventiveness which show more inherent homogeneity in the human race than we, with our civilised prejudices, care to admit. Man has never been content with the mere shelter of trees and rocks, nor to pluck chance wild roots or seeds, nor to hunt as do beasts of prey. Of palm, bamboo, and the skins of land and sea animals, of stone and clay, of copper and of iron, he has fashioned multitudes of objects made to serve his purposes and stamped with his individuality. What he has subsequently achieved by application of the latent power of air and water to navigation, and still later, by use of the pressure of gases, and the sources of heat and light hoarded by past ages in the bowels of the earth, and finally, in recent years, by utilisation of the still

more mysterious force of electricity, was initiated by primitive man, when, to accomplish the same ends, he made use of the animals and plants about him, and the soil beneath his feet. Consequently he was forced to meet conditions which might be favourable or might not. In the limited space at his disposal help might be difficult to get, and it is common knowledge that in certain localities like Oceania, nature has so little to offer that all development has been paralyzed. But even there, there is a tool which compensates for lack of human energy and speed. However rudimentary it may be, it is a germ capable, under favourable conditions, of becoming the starting-point of a long period of development, — like a creative act or an effort of will.

Nature provides man with materials which have their inherent requirements, their special aptitudes, — also their limitations, — and which lend themselves to certain uses rather than to others. To this extent nature does make suggestions, and at times restrictions. But nature is never more than an adviser. In the making of tools man has always had a definite purpose. In applying himself more and more to the improvement of his weapons, his hunting, fishing or agricultural implements, dwellings for the protection of himself and his possessions, his household equipment and his ornaments, — he has been guided by a desire to fit his tools to a well-defined purpose. Under whatever conditions of environment he found himself, — the first necessity

being self-preservation, — he concentrated all the skill and ingenuity he possessed on the attainment of this end. The results, however meagre they may seem to us, show evidence of qualities which differ from those which are so valuable in our modern civilisations, only in being based upon a smaller amount of past experience. There are certainly different degrees of inventive power, but the study of ethnographic material shows that ingenuity is always present, however limited the range of ideas and requirements may be.

The tools which man uses in the service of his ideal of life are the result of purpose and effort focussed on a particular mode of living. In that way they form a united whole, linked together, and interrelated. One application suggests another. In order to improve his offensive weapons, boomerang, assagai or javelin, blowgun or bow and arrow, the hunter modifies them to suit his needs. He curves or lengthens his bow according to the cast desired; he protects with a bracelet the arm which might be injured by recoil of the cord; he adorns the arrow with feathers to regulate its flight; he dulls its point for fear of injuring the plumage of the bird he intends to kill. He arms himself with a shield against attack. The shield, light and easily handled when used as protection against throwing arms, becomes longer and heavier when used with pike and lance, in order that the warrior may brace himself against the attack of enemies or of wild beasts. If the tropi-

cal African Negro practises the art of iron metallurgy, the shapes of his knives, their curves and carving and their saw-edges, are as varied as the uses for which they are intended.

The outfit which the Kirghiz has devised to meet the requirements of his unsettled life, — the shape of his tent and the cut of his clothes, — is a perfectly integrated whole, in which everything has its place, the materialisation of a mode of life. In like manner the equipment contrived by the Eskimo to meet the requirements of fishing, seafaring or quick transit across ice or tundra, — sleds and harness, kayaks and harpoons, clothes, igloos, — all constitute a unit, whose various parts are related to one another.

Are such achievements inspired merely by the stimulus of practical utility? There is an element which enters into every task executed with patience and meticulous care, something analogous to what sustains the artist in his struggle against matter, in his effort to communicate to it his inner feeling. Pottery illustrates this idea no less than primitive metallurgy. In Guiana and in Peru, from southern China to the western extremity of Barbary, the hand of the native potter moulds the clay to suit his fancy as well as his needs. The finish of certain articles made by the Eskimo with nothing but fishbone, or by certain Polynesians with exceptionally hard shells, or by the Maori of New Zealand with hard woods with which they encased the timbers of their sailing

craft, is evidence of a patience which is no less than the love of the artist for his work.

In Oceania, China, or Mexico as well as in ancient Japan, the artisan greedily appropriated certain hard stones such as jade, obsidian and serpentine whose lustre had intrigued him and of which he made statuettes and other articles, — luxurious art-objects handed down and preserved in part by advanced civilisations. The wonder we feel at the perfection of the polished stone implements made by prehistoric men of northern Europe and our amazement at the rock-engravings by which the artists of the caves of Spain and southwestern France cleverly reproduced the animals which they encountered in hunting, — such things reveal to us in those remote ancestors of ours the artist which hides within ourselves.

And so, out of native raw materials, however inadequate or obstinate they may be, man has asserted his intention and created fine art. Obeying his impulses and his individual tastes, he has humanised the environment for his own ends. At different stages there have been many spontaneous developments. Poor as is the material of indigenous civilisations in different environments, which is being revealed to us by a growing knowledge of the earth, it does represent, even so, not a beginning, but the result of oft-repeated effort in any given locality. Such rudimentary civilisations, which take us back to the early stages of our own, are themselves already an end-product, a result of progress which has meant

the exercise of initiative, will-power and artistic taste.

II. STAGNATION AND ISOLATION

It is, then, somewhat startling to discover that many such civilisations have ceased to develop, that the march of progress has been interrupted, and that in many cases the sap of invention seems to have dried up. The same agricultural processes are repeated year after year without modification in the Sudan, although new plants from America have been introduced there. The same plough as that in use thousands of years ago is still utilised by the Berbers along the shores of the Mediterranean. In central and western Africa typical dwellings, — cylindrical huts of mud and straw or rectangular huts with sloping roofs supported by posts, — are repeated *ad infinitum*, each in its respective zone. The Negro blacksmith works with his portable tools just as his remote ancestors did. The pottery of the Egyptian fellah as well as Castilian jars are true to traditional types, established once for all and thenceforth invariable, as is shown by comparison with carved monuments of antiquity.

Even in some countries of advanced civilisation a mode of life once achieved is a closed circle. The great mineral wealth of China has not made the Chinese into a miner. Nor has that clever farmer turned either to horticulture or to stock-breeding. The same old habits persist without perceptible

change. So that after having shown signs of an evolution capable of reaching a stage of relative perfection, there comes a certain impotence, an incapacity either to advance farther in the same direction or to start off in any other. The repeated efforts by means of which hunter or fisherman, agriculturist or shepherd, has assured his existence, seem to have sharpened his wits in a direction from which they never again deviate. A time comes when all effort ceases. If nothing novel appears to awaken activity, man lies back on his oars. A period of stagnation follows that of progress, which is the case in China and elsewhere.

Man is sluggish by nature. Temptation to lethargy is always watching its chance. Shipwrecked persons brought together accidentally in the archipelago of Tristan d'Acunha have been known to get so accustomed to a life of inactivity and indolence that after one or two generations they were incapable of doing anything at all. It is imperative, then, that a force from without should intervene. If we were to believe the poet,

> " Man's activity is all too prone to slumber,
> " He soon gets fond of unconditional repose;
> " I am therefore glad to give him a companion
> " Who stirs and works and must, as devil, be doing." [1]

Devil or no, this restlessness and discontent, capable of creative activity, exists deep down within the human soul; but it comes into action only in its own

[1] " Des Menschen Tätigkeit," — *Faust*, Scene I. (A. Hayward's Translation, 1881.)

good time, when and through whom it will. In order that it may be awakened, a vision of something better must appear in concrete form, for example, a glimpse of successful achievement elsewhere, sufficient to excite envy. Isolation and lack of fresh incentives from without seem to be a primary obstacle to such a conception of progress. Indeed, those human societies which have been isolated by geographical conditions either on islands, or in mountain fastnesses, or in deserts, or in forest clearings, seem to be cursed with stagnation and incapacity to move. Archaic modes of life are found most true to type in Iceland, among the Tuaregs and in Kafiristan.

But there is also another sort of isolation, one which man forges about himself by his own acts, by whatever structures he builds upon his own achievements. His feelings, prejudices, and all his conceptions of social life are wrought into his inventions, — into which he has put much of himself, — and the modes of life which absorb his entire activity. To these may further be added a religious consecration through ancestor-worship and respect for a past which is shrouded in mystery. The result is that he weaves a thick shroud which envelops and paralyzes him.

The entire life of the Guinea Negro is enmeshed with rites and superstitions which it would be as dangerous to violate as the Polynesian taboo. The traditional French peasant, like the Hindu, Cambo-

dian or Chinese farmer, is scrupulous to the last degree and such a zealous observer of practises that the essential is no longer distinguishable from the inessential. Each undertaking has such complicated regulations of procedure that initiative no longer has any scope. Any mode of living which has become so much a matter of habit, can but produce a narrow outlook in which intelligence can play no part. Whatever is unaccustomed is open to suspicion. Under such influences social organisms have been known to congeal, and for lack of new blood, public works undertaken for the common good have ended in merely preserving routine.

It has been said with reason that the basis of Chinese society is the family. A rigid hierarchy binds its members together, united by a worship of common ancestors. There is no question that the strength of this family tie has been a great help in increasing the population, and in the spread of a common training; also that it has been a source of social virtues. But has it not been an obstacle to progress? What is befitting to a patriarchal order is not suitable for a modern society. One is led to question whether such protection by the head of the family does not lessen initiative, whether it is not prejudicial to the development of the individual? The individualist, breaker of habits, has no place whatever in a social fabric which, from birth, influences every act of life, and does not loosen its hold even after death.

As has often been remarked, exaggerated develop-

ment of communal institutions narrows the horizon and produces, even in the midst of very dense population, an artificial isolation. A type of grouping, such as characterises the village of northern India, the Russian *mir* or commune, or the early group-organisation of villages in parts of western Europe, constitutes a permanent reservoir of particular trades and agricultural methods and systems of rotation, from which, once fixed, escape has been impossible.

Such organisations presuppose mutual understanding founded on age-old experience, the result of protracted effort and initiative; but they also show that, content with results achieved once for all, the mind has ceased to look for any others. In this way, what once was active has become static, initiative has become habit, and will power has faded into the realm of the unconscious. Similarly, certain animal groups have been able to raise themselves to a superior level of organisation. Untold eras of previous development have been required in order that the ant should remain in its ant hill, the bee in its hive; but such progress has now ceased or become almost imperceptible. All that remains of the innovations of the past is a certain momentum automatically transmitted from generation to generation.

III. CONTACTS

Sometimes it happens that contact with other civilisations slips off without making much of an impres-

sion on such callous organisms. There may be a certain amount of give and take, but between societies which are not yet ready to influence one another it is only superficial. When through the mediation of Spaniards and Portuguese the Dark Continent was put into communication with America, many new food-plants were introduced to African agriculture. "Toward the beginning of the sixteenth century manioc, maize, peanuts, pineapples, and possibly yams and sweet potatoes were brought to the Dark Continent,"[2] in other words, most of the plants which today are staple there. This ability to accept shows a certain aptitude for progress. But does it follow that the methods of tropical African agriculture were appreciably modified, that the plough replaced the hoe, or that new ways of improving and renewing the soil supplanted traditional methods? Not at all. Agricultural practises characteristic of that mode of life continued to be in favour, together with the social organisms to which they were so well adapted and coincident with which they came into being. Village life within a limited circle of cultivated land remained the outstanding characteristic of their civilisation. The addition of a few plants did not change it in the least. The horizon of these small communities, isolated each from the others and for that reason open to attack from without, remained as narrow as hitherto. Except along the fringes of

[2] A. Chevalier, Vol. I, no. 1, *Historique de l'agriculture en Afrique occidentale française.*

the Sahara no intense urban life has taken root on this soil, not because it was antagonistic to civilisation, but on the contrary, because an exclusive type of civilisation was already established there.

The introduction of the horse by Europeans upon the plains of North America made a sort of crisis in the life of the Indians. Certain tribes, quicker than others to make use of this aid to warfare, gained from the added rapidity of motion an advantage in attack and a sudden increase of power. For example, in the Northwest, toward the beginning of the eighteenth century, when the Blackfeet, originally established between Saskatchewan and the Peace River, first came into possession of the horse, they suddenly widened their sphere of action to Yellowstone and Rocky Mountains, at their neighbours' expense. The nomadic tendency to a greater or less degree inherent in a life of hunting, was certainly reinforced and its range widened by this importation from Europe. But there the influence ceased. Aboriginal life, possessed of this new means of strengthening its own individuality and dominating its neighbours, would have continued along traditional lines, had it not been for European intervention.

In the above instances, indigenous modes of life show sufficient vitality to make use of innovations, introduced by circumstances over which they have no control, for their own ends. They discover a means of self-defence within themselves and, even in newly adopted changes, ways in which to further strengthen

their own individual traits. They do not change. Riding on a horse instead of walking, using firearms instead of bow or spear, — such things do not materially alter habits of long standing, established in harmony with the local milieu. Direct impact of two very dissimilar civilisations produces only surface movements. But under the pressure of necessity, resistance is useless. There is no lack of instances of fundamental transformations brought about, either under pressure from without or as the result of economic causes, in well-established societies having marked individual characteristics. In our own day, under the influence of world commerce, the development of industrial and urban life at the expense of the agricultural and rural community is an instance of such a transformation, one which has resulted in changes not only in agricultural method, but in social relations, birth rate, family ties, foodstuffs, etc. We are impressed, stirred, often disquieted by these facts, but they are not new to history.

As a result of commerce, safety on the high seas, and colonisation, there grew up around the Mediterranean a social order which found its highest expression in the city. This amounted to a revolution, cities taking the place of towns, worship of the fatherland replacing the sanctuary of the home, and a public allegiance that of private relations, — an intellectual as well as a material revolution. Styles of dress were modified; they became simpler. Weapons were no longer carried. The soul of the citizen began to har-

monise with the appearance of the city. The city-idea was elaborated and amplified by Rome. It became an element of civilisation which could be communicated and adopted by an increasing number of groups. The network of Roman roads was its vehicle. From the Mediterranean basin the idea gained headway in a large part of central Europe. Commerce went hand in hand with conquest; the use of wine and flour became more general; markets were established; cultivated areas increased. But, in contrast to the Roman world, another type of civilisation was developing in Europe which was much less advanced, and sufficiently different for its peculiarities to impress the penetrating mind of Tacitus. There was not only conflict between these two worlds, there was gradual interpenetration as well. But centuries of pain and suffering elapsed before the two were united. The fusion was effected thanks to a religious organisation, itself a product of the Mediterranean melting-pot, a result of the blending of men and ideas which took place there. The Church served as a connecting link between two worlds which seemed mutually exclusive, the Roman and the Germanic. What Rome had accomplished, Charlemagne in his turn proceeded to do likewise. He became a founder of cities.

These changes, however great their influence upon the history of civilisation, were far from overthrowing all earlier social orders. In the study of human societies, as in those of plants or animals, variations

and survivals must always be noted. Even around the Mediterranean, life of the clan, the carrying of arms, fortified sites and blood feuds have by no means disappeared. Albania is at present a conspicuous survival of these archaic practises, — nor is it the only one. But such direct responses to local environment have become the exception. Other seeds have grown to maturity side by side with them, — other forms of life have come into being and have exerted their influence. There has been an almost infinite enrichment of the raw materials with which civilisation has to work.

IV. CONTACTS DUE TO INVASION AND THE IMPACT OF CONTRASTING MODES OF LIFE

Western Europe has had an almost continuous development. This has not been the case in North Africa nor in Asia bordering the zone of desert and steppe. From Morocco to India and from Russia to Arabia peoples have maintained constant relationships, but most frequently they have been hostile because of totally different modes of life. Great empires have arisen, from Persian to Arab and Mongolian. Islam has enlarged its vast domain. But none of these empires has survived as long as that of China, or of Rome, whose influence continues through the medium of the Church. The chain was broken in North Africa and in Spain, in Asia Minor, Persia and northern India as well as along the banks of the Dnieper and the Volga, by Arab, Turkish and

Mongolian invasions. They interrupted normal development. They deflected it and made it necessary to begin all over again. Though these migrations from the Altaï to western Asia, — which had already begun in the time of Herodotus and were described by him, continuing throughout the period between the fourth and the tenth centuries A.D., in particular, — ceased to take place on a large scale a century or two ago, they nevertheless are still continuing on a small scale between tribes or clans and neighbouring villages, between Kurds and Armenians, for instance, Albanians and Slavs, Bedouins and fellahs.

And yet, throughout these vicissitudes faint traces of bygone civilisations still persist. Underneath successive disguises the people of Egypt retain their sphinx-like expression. The Persian lives upon his memories and his poets. Asia Minor, North Persia and Turkestan have been "Turkeyfied," but, as in Athens where Hellenic manners appear beneath a Turkish veneer which peels off, so in Asia Minor it is not hard to discover the profound influence of Thracians, Phrygians, Hittites, Aramaeans, and in Armenia and Persia, of all those ancient peoples who erected sanctuaries and monuments. The old nationalistic religions of Syria have been broken up into sects.

What the invaders here and there did impose was their own language. It was put on like a garment. It is true even today that in order to meet the re-

quirements of a more complex existence than that of the steppes, Turkish dialects and Tatar speech, — which in northern Persia and on both sides of the Pamir have replaced Iranian dialects, — have been obliged to borrow extensively from Persian and Arabic. As for the language of the camp, called Urdu, which has grown up about the Mongolian sovereigns of Delhi, it is none other than the Hindustani language infused with Persian.

In spite of its simple and rigid framework, Mohammedanism is no exception to the general rule; it has been modified to suit the environments where it has taken root. There are Marabouts in Barbary, Shiites in Persia, and in India it is altered by contact with Hinduism. Its development has been moulded by environment.

The result has been a division of religions into sects, and of consolidated nations into myriads of small nationalities. Armenians, Parsis, Jews and Syrians are remnants of peoples whose axis has been displaced. Commerce and industry have been monopolised by them, just as formerly by Phoenicians and Greeks along the periphery of the ancient civilisations of Egypt and Assyria. They swarm and multiply around the margins of great peoples and serve the purpose of keeping up traces of activity between bodies having a tendency to inertia.

At present there is a reaction against this disunion. Only yesterday the balance shifted once more. North Africa, central Asia, India and Egypt have

come within the sphere of influence of great powers. Turkey and Persia feel it closing in about them.

V. CONTACTS DUE TO THE DEVELOPMENT OF MARITIME COMMERCE

Life is kindled at another point. The occidental world had seldom had even remote glimpses of the great civilisations of the Far East. But now contacts are becoming closer and this is one of the most interesting human experiments of the present day. Since 1860, under Lord Dalhousie, India has been building railways under the control of a foreign government. During the last few years railways have been building in China also. Since the epochal date of July 8, 1853, when the squadron of Commodore Perry appeared at Tokio, Japan has been thrown open, part way at first, later more fully. Its first railway was built in 1872. Today its factories and science, even its dress, are European. No country started later, nor has made more rapid progress. The change is disconcerting, and yet, it seems as if this people has only been obeying once again a peculiar law of its development, and that this most recent casting off of tradition is merely a repetition of that which put ancient Japan under the tutelage of Korea and China so long ago. When Buddhism swept through Japan in the sixth century of our era, it brought about a revolution similar to that which Christianity occasioned in the barbarian world of the Occident. But beneath all external changes Japan

has jealously guarded its individuality, — an island people surrounded by mountains and a deeply indented coast-line, with its pilgrimages to sanctuaries beneath the shade of Cryptomerias, its love of smiling and blossoming nature and of the religious art which interprets it. Has it gained its singular aptitude for assimilating European science and whatever seemed basic and fundamental in other civilisations from a previous incarnation? It would be very embarrassing to have to say whether such aptitude is due to racial qualities, to ethnic composition, or to geographical location. It is merely noteworthy in passing that the present does not differ from the past.

This island empire is a striking contrast to the mental attitude of deeply rooted continental civilisations sending up shoots all around them, — China, for instance, or India. European commerce and that of the United States are laying rival siege to the Chinese. So far they have met with only indifferent success in attempting to instill in them new desires. If the foreigners have succeeded with regard to a few articles it is because they have complied with Chinese tastes and customs. China does not readily assume the rôle of a pupil, accustomed as she is to spreading her own civilisation and to considering herself the centre of the universe. She is firmly intrenched in her attitude of arrogance. To the subversive ideas of Europe or America and to their foreign merchandise, she opposes her system of ethics, her philosophy, her literary traditions, her domestic habits and her

conception of comfort and well-being. She has long received these zealous rivals, offering her cotton cloth or machinery, gasoline or matches, with disdainful indifference. But she is yielding, nevertheless, and is beginning to accept certain articles. The Chinese, as the people of Lyons say, is becoming "an interesting economic individual." A period of fermentation has begun whose development cannot be foreseen. But what is true of Japan is also true of China: the foreigner is imitated because of a wish to be rid of him, which has its origin in xenophobia.

India has certainly made progress through contact with its British lords, but toward what end? Whenever the English have attempted to modify the social structure, as they believed, for the better, to create in Bengal, for example, a landed aristocracy by favouring the *zemindari* at the expense of the *ryotts* (1793), the attempt has either miscarried or turned out badly. But on the other hand, they have met with success wherever they have conformed to tradition, or have developed municipal organisation, or have respected native authority. The castes have not lost their hold in the least. The entire social structure has remained very nearly intact. Education, the press, universities and propagation of the English language have influenced native mentality, but in a sense different from that which had been anticipated. There are skillful physicians and surgeons among the natives; but the axis of thought has not swerved. Never has the attention of educated Hindus been

more fervently directed toward ancient sacred books than since European science has brushed them with the tip of its wing. And as for the populace, one of the chief results of better transportation facilities has been to increase the flow of pilgrims toward the ancient sanctuaries. Thus does the branch twisted by the wind spring back into its accustomed place.

One consequence, and a vital one at that, of British domination is already beginning to appear, — namely, consciousness of a certain identity of civilisation between dissimilar peoples who, in the India of yesterday, were not aware of each other's existence.

VI. GEOGRAPHICAL NATURE OF PROGRESS

When Pascal refers to the generations of men as a single man who lives forever and is continually adding to his store of knowledge, he is expressing a philosophical view of society which the present state of civilisation would seem to support. But that does not imply that progress is always made at the same regular, even pace. The whole course of history disproves such a contention. Fully half the countries on earth today have learned nothing for thousands of years. They are cranked up to the top notch, as it were, to a maximum development which, once attained, has never been exceeded. Such progress has meant that local societies could continue to survive where they were; but they have not expanded.

In some parts of the earth, however, notwithstand-

ing frequent vicissitudes, progress has seldom been interrupted. The torch has passed from hand to hand, though not without accidents. What is the explanation of such good fortune, and why should such differences exist? These localities are distributed in such a way that there must be some connexion with purely geographical causes.

Is it by mere chance that the Old World countries of the northern hemisphere, between Mediterranean and China Seas, have been the arena of most of the great events which have moulded civilisation?

One cannot help being struck with the comprehensive sweep of the social, religious or political events which are datum points in the march of progress. Within this area, for example, the expansion of identical families of languages, denoting similar habits of mind, has taken place,—Aryan from India to Germany, Semitic from Arabia to the Maghreb. This is also where religious systems on a moral and philosophical basis have been most widespread. Two main religions, Christianity and Mohammedanism, not only originated here, but found here their theatre of development as well. And even if it is doubtful whether, in the sense in which Oscar Peschel understood it, there is a "zone of founders of religions,"[3] it is safe to say that there are parts of the earth where religious systems have had special facilities for expansion. Did not Buddhism itself, offspring of India, travel across central Asia over the very trade

[3] O. Peschel, *Völkerkunde*, Leipzig, 1877, pp. 324–336.

routes by which the region called Serica had already been revealed to the Occident?

The same can be said of modes of life. Most agricultural and horticultural processes, methods of irrigation, as well as use of the plough, have spread extensively within this territory. It is true that pastoral life, always so highly developed within this zone, implies a nomadism which is usually considered an inferior mode of life. But in reality, this type as it exists in Asia and North Africa, from Altai to Atlas along the borders of the steppe, with its centres for the exchange of products in the oases or on the borders of cultivated lands, is a relatively high type of civilisation. It encourages wide relationships by means of caravans and bazaars, and, at points of contact, the growth of markets and towns. Finally, it makes possible the patriarchial luxury of the tent. Great historical events by which mankind has been profoundly stirred originated in this environment. Families and tribes have formed federations and assembled in hordes which have had flashes of almost world-wide power. The case of the Mongolian empire, which in the thirteenth century caused Europe to tremble, was neither an isolated nor a superficial phenomenon.

VII. NODAL POINTS

In some localities the chain of progress has been broken, as in eastern Europe and western Asia, and then incompletely repaired or repaired after a lapse

of time. In others, progress has never entirely ceased. Such regions have never suffered alarming breaks in continuity. For there has been an uninterrupted sequence of related political systems. (As in western and central Europe, or even Egypt, etc.)

After all, in the history of human societies, events on a large scale never occur unheralded. First of all each group must overcome difficulties resulting from remoteness, peculiarities of environment or mutual hostilities. A growth in embryo precedes full development. And so we must go a little farther back along the chain of events.

The Roman Church was an outgrowth of the Western Empire just as the Greek Church of the Eastern Empire. Mohammedanism established its sovereignty at the expense of the latter as well as of the empires of Persians and Sassanidae. But these various empires were themselves built out of older elements, having absorbed the empires of Egypt, Chaldea and Macedonia. Mounting still higher on this ladder of the past, these great political organisations can be split up into many smaller units, into myriads of distinct centres, each with its own individual life. The might of the Pharaohs developed from the swarm of nomes upon the fertile banks of the Nile. Little principalities, only a few of whose names have come down to us, were built into the frame-work of the empires of Tigris and Euphrates. A multitude of cities similar to Athens, Corinth and Miletus, grew up near the Mediterranean opposite

the colonies of Sidon, Tyre and Carthage. The strength of Etruria was absorbed in that of Rome, just as the older Hallstatt type of civilisation north of the Alps was submerged in the Roman Conquest.

And so these phenomena whose magnitude astounds us have been but a recapitulation of earlier developments. In the beginning there were quantities of distinct centres, societies of lesser dimensions, microcosms, each with its own sphere of action. These it was which served as nuclei for larger organisms, which later inherited the results of their labours. They had grown up spontaneously by virtue of local circumstances under peculiar environmental conditions. The alluvial soil of Nile and Euphrates, the dissected Mediterranean coast-line, the outlets of routes from the continental hinterland, by way of Rhône, Danube, or the northern coast of the Black Sea or Syria, — such, in a word, were the peculiar advantages which had conspired to maintain relationships in this corner of the earth among societies of distinctly different origin.

Out of the assembling and blending of such varied elements grew empires, religions and states. The steam roller of history has passed over them more or less heavily, with alternate disaster and recovery in its wake, movements and counter-movements, plagues and benefits, — in a word, whatever is involved in the play of human events. But geographical influences have been at work throughout all these vicissitudes.

Societies working out their destinies within the area comprised by Europe, western Asia and North Africa have almost never failed to influence one another profoundly and persistently. They established relationships anticipating those which have been developed in the world of today by the extension of trade-routes. Horizons have progressively widened. Roman roads and maritime navigation gave rise to an urban development of which Rome and Alexandria are typical. Rome had its granaries in Egypt, just as those of modern and industrial Europe are located overseas. A balance was struck between centres of production and consumption. And so, in the economic world of Rome some of the relationships between Italy, Gaul and the province of Africa, which have their fullest development on an infinitely larger scale in the modern world were already beginning to appear.

Such a precocious development is a result of geographical causes, — not of simple causes, but of a very complex total whose influence can be traced, thanks to relationships continuing throughout long periods of time. Neither the big river-valleys, deep in alluvial soil, nor the living waters of the Mediterranean, nor the opulent plains of the Danube or of southern Russia, suffice of themselves to explain the persistence of the various growing civilisations. But distribution of land and water, dovetailing of plains and mountains and contiguity of steppes and forests in this part of the world are such that a combination

of geographical causes has been more effective here than elsewhere. Each has been an incentive to the other. This historical phenomenon has occurred only here in Europe, because American civilisations were confined to the plateaus, while Chinese civilisation, so remarkable from many points of view, remained almost exclusively limited to the plains. European civilisation was nourished in its origins in a multitude of distinct centres, and has absorbed the substance of a great number of local environments. From these local developments and from this long process of integration, — which mutual contacts have actively promoted, — Europe has gained its wealth and fecundity. Converging land-forms and the contiguity of cleared and forested areas, all have had their share in producing a combination of relationships and geographical forces which no other region on earth has had to the same degree.

PART III

TRANSPORTATION AND CIRCULATION

CHAPTER I

MEANS OF TRANSPORTATION

I. MAN AS A BEAST OF BURDEN

Since the beginning man has always been endeavouring to solve the problem of transportation and circulation. The first means to this end was the use of his own body, and the first variation in type resulted from adapting it to contrivances for lightening the burden. Sometimes it was a pad beneath a weight on the head giving to women-carriers the bearing of caryatides; sometimes a staff for the porter, shoulders stooping beneath the load. In regions where the supple bamboo grows, the coolie fastens across his shoulders a long rod at whose extremities are attached two equally heavy weights. The Mexican of Anahuac, bound by thongs which hold the burden on his back, plods along like an ox, with bowed head. The Turkish hamal or the French worker in the vineyards, takes an attitude necessitated by the pannier. It is common knowledge that the postures of men struggling with heavy burdens have furnished endless themes to the plastic arts, the best possible commentary on such early variations.

Human portage, the most universal as well as the most primitive means of transportation, is funda-

mental to any general survey of this subject. In the Andes, where it has long been dominant, — almost exclusive, — this habit seems to have modified the physique. The respiratory organs of the natives enable them without discomfort to climb slopes which would put a European out of breath.[1] The importance and the anti-social character of the above type of forced labour in the parts of central Africa where there are insects poisonous to our beasts of burden are well known. Again, human portage has come to be used almost exclusively in regions, even though very civilised, whose high density of population debases human labour to such an extent that any other method is unnecessary. Such is the case, apparently, in the Chinese province of Szechwan.[2]

Man has displayed no less ingenuity in surmounting obstacles than in easing burdens. Before venturing upon the sea he mastered navigation on inland waters. The pirogues hollowed out of the trunk of an oak found in our peat-bogs and the boats of skins calked with reeds which Herodotus describes along the upper Euphrates are instances of how man has made use of materials at hand. From the Euphrates to the Hwang inflated ox-hides are still used today for crossing rivers. In this respect the new world is no less advanced than the old, witness the light, portable canoes of birch-bark made by

[1] E. Grandidier, *Voyage dans l'Amérique du Sud*, Paris, 1861.
[2] *La mission lyonnaise . . . en Chine*, Lyon, 1898, p. 120.

the Indians of North America. Few peoples are without inherent originality. "The Pampeans and the Chiquitians," says d'Orbigny,[3] "have never thought of seeking any aid whatever in crossing streams. But the Guarani and Moxo had enormous dugouts. . . . The Araucanians . . . had only shapeless rafts of tree trunks on the seacoast, but, in the high Andes where there was no timber, the Aymara devised boats of reeds securely bound together. On the desert coast of Atacama they made two immense bladders out of sealskins which they filled with air and fastened together."

Many other instances of similar contrivances might be cited, specimens of which are the pride of ethnographical museums today. They demonstrate the multiple origin of local inventions, each with the environmental stamp. Sometimes flora, sometimes fauna have been made use of. The strong flexible lianas of tropical forests have provided other means for crossing streams than those devised by shepherds of the steppes. In fact, there is no region on earth where man has not found some raw material suited to his purpose. Sometimes it is rather an effort of will or initiative than material which has been lacking. What can be said is that the local materials which he succeeded in adapting to his needs were often such unsatisfactory makeshifts that he would not have continued to use them had it been possible

[3] A. d'Orbigny, *Voyage dans l'Amérique méridionale*, Vol. IV, Paris, 1839, p. 102.

to obtain anything else from abroad. That is the chief lesson taught by these products of primitive human industry.

The stage which they represent is that of the first, futile fight against the isolation which kept inventions from being passed on from one to another.

To drag a burden rather than to carry it is an idea which, in itself, does not imply any great intellectual superiority, because ants, beetles and other animals could serve as models for mankind in this regard. But man was concerned with the principle, which led to mechanical inventions. The habit of placing a cylindrical body between the ground and the weight to be moved gave rise to the Assyrian sets of rollers, carved on their monuments. But the primitive roller and wheels, whether solid or built up, whose axle bears the cart, are separated by a great gulf, which could be bridged only by a stroke of genius. When and where did that occur? It is embarrassing to have to say, in spite of the Chinese legend which attributes this significant accomplishment to an emperor who reigned more than forty centuries ago. But certain regions, at least, can be eliminated from the list of those claiming to have made the invention. A section of a tree trunk, which was the primitive type of wheel,[4] had to be made of hard wood and of trunks of large diameter. Such materials are difficult to find in regions where palms and trees with

[4] G. Forestier, *La roue, étude paléo-technologique*, Paris-Nancy, 1900.

soft or spongy wood make up the bulk of vegetation. The invention naturally suggests oak and other hard woods of cold or temperate climates.

It might be maintained, moreover, that the true cradle of an invention is the environment in which it is developed and its uses are diversified. Such, for example, a century ago, were mining districts for rail- and steam-transportation. In prehistoric times,— to which one must go back in order to discover the origin of wheeled-vehicles,— only certain definite regions seemed to be capable of popularising it and increasing the uses to which it can be put. They are those where, in addition to the right sort of wood, there are extensive level plains and low relief. If necessary, the wheel, set in motion by a man's strength, as with the wheelbarrow, can be used on rough, uneven ground. But in the case of animal traction, conditions of soil and relief are of first importance. Since use of carts long preceded road construction, there is no lack of instances, from earliest antiquity on, of animals yoked either to the plough or to the cart. This is true of China as well as of Chaldea.

The war-chariot is described in the oldest annals of Mediterranean peoples. It made its way relatively late into Egypt: but the date can almost be fixed when, in its forward march, it was introduced there, at least as loot or fighting device. The date was about that of the eighteenth dynasty, or about 1800 B.C.

We thus are confronted by a question which must be discussed before proceeding further.

The wheel was developed because of animal traction; so we must find which animals man succeeded in domesticating for the requirements of circulation and transportation.

II. THE DRAFT ANIMAL

One sometimes thinks of central Asia as a richly endowed region from which a complete set of useful animals once emerged as from a Noah's ark. As a matter of fact, there were many other regions besides central Asia where man had produced such helpers: Tibet, for instance, and India, the Sudan, the Berber-Hispanic region and central Europe, as well as the Andes. The various types developed in widely different environments were useful as a match for the variety of obstacles to be surmounted.

The earliest domesticated animals were not domesticated for purposes of transportation. The dog, sheep and goat, — animals which, in spite of services they may render on occasion, do not belong in this category, — without doubt preceded the ox, horse, donkey, camel, etc. Possibly the ox may have been the first beast of burden. In such a capacity it appears in Chaldean and Chinese tradition, and in Germanic mythologies. The use of cattle as carriers must always have been limited, — as it still is. But if heavy loads have to be moved, their strength, especially in combination with the wheel, is a power-

ful lever in breaking through brush and surmounting obstacles. Even today nothing can take the place of the cow upon the mountain-trails of France, nor of the buffalo in paddy-fields and swamps, nor of the ox upon plains where sugar-beets are cultivated. Nevertheless, we might be led to minimize the services of this auxiliary in the history of human wanderings and commerce, if the Boer migrations had not provided a recent illustration of its importance. In the thirteenth century the ox was the animal most commonly employed for transportation purposes in trade between the Sea of Azov and the Volga. This fact was noted by an envoy of St. Louis, the monk Rubruk.

But for general travel the ox was relegated to second place by animals which had been trained for this particular purpose in other environments. In open countries, where, because of scanty vegetation, herds in search of food formed the habit of covering great distances, the horse or the camel had developed qualities which were made the most of in domestication. Among the Equidae, — whose lithe shanks, hard hoofs and large nostrils are made for speed, — two domesticated breeds were distinguishable in very early times, the Turkoman horse with round forehead and the Iranian horse of Media with flat forehead.[5] But there is nothing to disprove the belief that there have been other centres of domesti-

[5] Ch. A. Piétrement, *Les chevaux dans les temps préhistoriques et historiques*, Paris, 1883.

cation, central Europe, for example, where certain breeds of wild horses were very common in the paleolithic period. Tacitus says that the Celts, predecessors of the Germans in central Europe, had superior methods of horse-breeding. The Greeks learned their methods from Phrygians or Thracians as the Chaldeans had previously got theirs from the Medes.

No doubt the spirit and warlike bearing of the horse greatly contributed to its early adoption by man for military purposes; but even for such uses it had been harnessed to the chariot in Assyrian or Achaean wars. Thus animal and vehicle were introduced almost simultaneously. Proof of its recent introduction into southern Asia is found in the fact that in the time of Strabo it was not used in Arabia,[6] where it became plentiful only in the centuries just preceding Mohammed. The qualities which it later developed there are common knowledge; and this is an excellent proof of its great adaptability, resulting from the variety of different breeds. Such diversity has enabled it to occupy the immense domain extending from the habitat of reindeer to that of elephant, namely, from the Yakut to tropical Asia and Africa, — not to mention its recent phenomenal increase in America!

[6] *Geography of Strabo*, XVI, Book 4, 2; *idem.* XVI, Book 4, 26. On the other hand, during the same period, it was the horse and not the camel which was used in crossing the Sahara. Such journeys were less frequent then than they became later, after Mohammed's time.

Przewalski has drawn attention to the existence of wild camels between the Tarim and Lake Kuku-nor. The species called Bactrian, with two humps, seems to have originated in central Asia, — a beast of burden rather than draft animal, capable of but little speed, never making more than four kilometres an hour; but by reason of its docility, its sense of direction [7] and its skill in finding its own food near encampments, it is an animal fitted for journeys [8] lasting for months at a time and to play the rôle of ship on long voyages through arid regions. It is not a fighter; its sluggish habits could not be altered without damage, and expeditions of such a nature on which it has been employed in our own day, — whether in Turkestan or in Asben, — have resulted in a veritable slaughter of these unfortunate animals. As to speed, a process of skillful selection seems even in antiquity to have produced a valuable breed of racing camel, the dromedary or *méhari.* Credit is doubtless due to the Nabataeans. "These people greedy for gain," says Strabo, "were professional caravaneers along the ancient route from Babylonia to Egypt." Their monopoly was due to their possession of a perfected breed of camel. In the dry,

[7] Instinct leads it along paths covered with sand. (C. E. Bonin, *Voyage de Pékin au Turkestan russe*, *La Géographie*, Vol. III, 1901, I, p. 120.)

[8] It can cross the Gobi Desert in thirty days. (*Mission Dutreuil de Rhins, Le Turkestan et le Tibet*, F. Grenard, Part II, Paris, 1898, p. 199. — K. Futterer, *Geographische Skizze der Wüste Gobi*, *Pet. Mitt.*, *Erg. heft. no.* 139, 1902, p. 30.)

healthful climate of the Nedjed they could produce fleeter animals than elsewhere, better able to endure thirst.[9] Thus they had a means of competition.

It was no mean advantage to the ancient societies between the Mediterranean and southwestern Asia, to have at their disposal the perfected products of these two different families. Furthermore, though horse and camel were obtained from the north, the ass came to them from the south. The ass is a native of Africa, originating, not as has been supposed, — because of confusion with the hemionus (kiang), — in the steppes of Mespotamia, but in the open country of stiff, hard vegetation, which separates the Sahara from the Sudan.[10] It spread northward by two different routes, one, through the Atlas countries formerly connected with Spain, the other, through the valley of the Nile. It was domesticated in Upper Egypt at the dawn of history, because the monuments show that is was as plentiful in the first dynasty as it is today. There it was the object of a constant demand which was supplied by fleets which came from Nubia by water. The services for which it was peculiarly adapted by nature were so important in countries of finely dissected topography, small

[9] The dromedary can go five or six days without water. It covers the six hundred kilometres between Hail and Bassora in six days.

[10] Fr. Lenormant, *Sur l'antiquité de l'âne et du cheval comme animaux domestiques en Egypte et en Syrie. Comptes rendus . . . de l'Académie des Sciences*, LXIX, 1869, pp. 1256–1258. Observations oi Milne-Edwards, p. 1259.

land-holdings and local activities common all around the Mediterranean, that it multiplied rapidly and in the end became in such districts the family companion and the social support of the lower classes.

But, as students were not slow in perceiving, its area of expansion toward the north is limited. The Greeks knew that it could not endure the cold of Scythia. While it is in common use today in eastern Turkestan, it is not found north of the Tian Shan.[11] That is what suggested the idea of mating ass and mare. In Assyrian sculptures the artificial product of such a union, called a mule, appears saddled and bridled as today. Very early there were centres where it was bred and marketed, — in Homeric times Armenia and Cappadocia, as today Poitou for Spain, Yunnan for Tibet and the Argentine states of Jujuy and Salta for Bolivia. What were the primitive centres of production for China? All we know is that the mule was very early made use of in North China. In that case, as in other similar instances, one is again struck by the significant fact that, though unlike us in so many other habits, material as well as intellectual, methods of transportation in North China singularly resemble our own, a similarity which has existed from an early date. But the similarity stops with North China; it does not include Japan.

In comparison with the animals just mentioned, others utilised for purposes of transportation have

[11] *Mission Dutreuil de Rhins*, F. Grenard, Part II, p. 199.

merely local significance. The elephant with its superb massive bulk is a war-machine or the luxurious vehicle of a rajah rather than a domestic servant. The four-square, firm build of the yak, with its short legs, makes it indispensable for scaling the heights of eastern Tibet; but it lives only at great altitudes. The reindeer excels all others in negotiating the peat-bogs of the summer tundra, but flees from our summer heat and mild marine climates. The llama was the only beast of burden of the early American civilisations, but its strength is limited, and it makes only three or four leagues a day. In short, from what has been said it is clear that apart from any question of common origin, there was nevertheless a region where conditions were peculiarly favourable to the use of animals, both for carrying and for draft, and where, through imitation or competition, their use became widely prevalent. That region was the semipastoral, semiagricultural zone which diagonally crosses the temperate regions of the Old World. The domestication of certain animals peculiarly suited to man's needs leads to that of others not so well suited. But in America where, though obviously inferior in quality, there were nevertheless certain resources at hand, neither bison nor caribou was ever domesticated.

III. WHEELED-VEHICLES

Obstacles to traffic are very unequally distributed over the surface of the earth. Certain localities are

particularly difficult, such, for instance, as the folded chains of Eurasia or the American Cordilleras, or the marshes of tropical regions with seasonal rainfall, — especially the equatorial jungles of Africa or America. But other regions offer natural facilities for getting about. They are chiefly those regions where deposition being in excess of erosion, the surface is covered with a mantle of soil levelling off all inequalities of relief. Such conditions are found in quite diverse parts of the temperate zones, — American pampas or prairies, high plateaus of North Africa, loam or loess plains of western and central Europe and the black-earth belt of Russia. Nowhere are such conditions found on a grander scale, in one single sweep, as it were, than in the inland region, without access to the sea, between the Volga and North China. There is the vast arena of wanderings and migrations par excellence, where, like herds of animals roaming over the steppes, or great flocks of birds swooping down upon stretches of water, men early learned to move in hordes.

It must not be thought that such localities permit unhampered circulation. When mountains do not present obstacles, which is frequently the case, there are streams and lakes, — and deserts. Winter snow and rain in Persia and Turkestan, spring and fall mud and quagmires in southern Russia and Siberia, either interrupt progress or obstruct it completely. But it is none the less true that during the greater part of the year, nature, almost single-handed, at-

tends to the upkeep of the highways. The long corridors across Persia, from Armenia to India or from Armenia to Turkestan, are described by explorers as avenues prepared by nature for roads or railways.[12] The same remarks apply to zones crossing central Asia, — narrower still, but even longer, — connecting Turkestan with the Gobi desert and with the western borders of China.[13]

From the point of view of circulation the chief advantage of these and similar regions lies not only in a minimum of obstacles but also, — and especially, — in the fact that the same means of transportation can be used throughout. The ideal actually reached by modern civilisation, namely, a system of railways uniform throughout enormous sections of territory, already dawned as a vague possibility in those distant regions. There it was possible, thanks to animals such as camel and horse, to traverse very great distances with regularity and without resorting to any

[12] Between Kum and Kirman for more than a thousand kilometres the topography presents no difficulties. (A. F. Stahl, *Reisen in Nord- und Zentral-Persien*, *Pet. Mitt.*, *Ergänz. heft.* no. 118, p. 38.) The expedition of Sir Frederic Goldsmid gives the same testimony as to the still longer passage from Ispahan to Bampur. (*Eastern Persia, An account of the Journeys of the Persian Boundary Commission*, London, 1876, Vol. I.) — On the high plateaus of Algeria railways had only to be laid upon the surface of the ground.

[13] "Wherever there are not too great accumulations of sand," says Grenard, "there are wide, flat natural routes, better than the artificial roads of China." *Mission Dutreuil de Rhins*, Part II, p. 200.

other means whatever. Once the outfit of tents or kibitkas was fastened on the backs of camels, once the horse was saddled, or, better still, harnessed to the conveyance, nothing stood in the way of departure, necessitated as it was by various circumstances capable of inducing colonies to migrate in greater numbers and on a much grander scale than anywhere else on earth.

And so we come back once more to various points previously considered as to the origin and source of primitive means of transportation and circulation. Practical applications and improvements, suggested by constant intensive use, were made in localities predisposed to such developments by advantageous conditions of soil and topography. In North China we know that four-horse carts were in use at least eight centuries B.C. In classic texts documentary evidence is especially plentiful in regard to the regions inhabited by peoples called Scythians or Celts. Though the Romans built roads, it was the Celts who manufactured the improved wheeled-vehicles which travelled upon them: the light, rapid *rheda* in place of the heavy Italiote *plaustrum*, for instance.[14] There are numerous examples in our archeological museums of the practice in northern Gaul of covering different parts of the wheel with metal strips. These specimens represent a great variety of types. While in Burgundy the wheels which have been ex-

[14] Wilhelm Götz, *Die Verkehrswege im Dienste des Welthandels*, Stuttgart, 1888, p. 302, pp. 334–5.

cavated from graves are heavier and bulkier, those from Reims are very large, very delicate and yet very firm beneath their iron rims, — there on the threshold of the great plains stretching away toward central Europe from Champagne and Belgium.[15] The vehicles which moved across those plains long before the Christian era are legitimate forerunners of the light buggy, the conveyance characteristic of the American prairies. Furthermore, the wheel had been used in agricultural pursuits in the plains of northern Gaul, a use which was entirely foreign to the Roman world.[16]

Means of transportation in the regions mentioned had not only speed, but capacity, — tonnage, to use the current term. One of the things which struck the Romans in their encounters with the Cimbri was the size and capacity of their carts, which, when placed side by side, formed an enclosure for the entire army, in which there was room enough for families and possessions as well.[17] Identical geographical influences tend to produce identical results. And so it happened in the thirteenth century that Rubruk was amazed at the enormous proportions of the covered waggons used by the Tatars in their caravans on the steppes of Russia. And the same impression is gained today from types of conveyances used on the Pampa

[15] S. Reinach, *Catalogue . . . du musée . . . de Saint-Germain . . .*, Paris, 1891, p. 164, etc.

[16] Examples: wheeled plough and wheeled harvester (Pliny, *Nat. Hist.*, XVIII, 48; XVIII, 72; Varro, *De Re Rustica*, I, 52).

[17] *Plutarch's Lives*, Caius Marius, Chap. XIX.

of Argentina, or on the plateaus of South Africa, — huge vehicles drawn by dozens of animals, horses in America, oxen among the Boers.

A study of geography thus discloses vast tracts of land where circulation takes place on a large scale without artificial roads. This explains why such regions, — where, in addition, strong, powerful animals which could be broken to harness were found, — early became important in the history of human relations. Furthermore, the domestication of the horse, which was accomplished toward the end of the neolithic period, is an achievement which has a basic relation to a whole series of archeological and historical facts. This we shall try to show by a few striking examples.

A fact often pointed out by students of prehistoric archeology is that the successive introduction of various metals worked in western Europe outside the Mediterranean area, gold, at first, and bronze, and later iron and silver, must have coincided with the arrival of new peoples. Indeed, such beginnings are plainly coincident with the appearance of rites and practises not previously known. It is alleged that otherwise it would be difficult to explain the remarkable degree of perfection shown from the outset by this type of industrial manufacture.[18] Any thought of vast popular migrations is inseparable

[18] C. Engelhardt, *Guide . . . du musée des antiquités du Nord à Copenhague*, Copenhague, 1876; — Salomon Reinach, *Catalogue . . . du musée . . . de Saint-Germain.*

from that of changes in type of culture which henceforth were to take the place of primitive stagnation. What was the direction taken by these human currents? Doubtless there were many. There were continental routes both from east to west and from north to south. But they were not all. The most striking and noteworthy fact is that following the essentially local characteristics of the remains of earlier civilisations with their limited horizons, unheard-of changes took place in parts of Europe and Asia. Similar cultures appear throughout wide zones in response to similar conditions of relief and soil. There is scattered evidence of such wide zones between southern Russia and Hungary in the Kurgans, or *tumuli*, so rich in neolithic finds, and even beyond the Ural Mountains into northern Asia. Between 1768 and 1770 when Pallas completed the first trip for purposes of scientific exploration in the area between the Ural and Altaï mountains, the traces of common metallurgical processes which he observed all the way to the Yenisei [19] were to him a subject for never-ending amazement and meditation. He noted traces of ancient mines which at that time were serving as gathering-places for Russian prospectors, also the gold and copper objects and the identical burial material in heaps of stones, recalling the tombs of the giants with which he was familiar in North Germany, his fatherland.

[19] *Voyages de Pallas* (French translation, 1788–93), Vol. I, p. 384; Vol. III, p. 193, p. 420.

From that time forward, whether direct or not, intermittent or continuous, relations were definitely established, — together with the more and more general use of metals, — along the zone of travel uniting central Europe with central Asia. It was an indication of great social changes. That this was the case is shown by the increasing number of exotic objects, by traces of mutual exchanges and by imitations of foreign articles down through the ages, which finally resulted in a blend of the elements of civilisation itself, giving rise to new requirements and stimulating the spirit of invention. As soon as great distances could be covered a new ferment was introduced into human society.

It would be an exaggeration to speak of trade-routes in connexion with those remote ages. And yet the origin of some of the highways, shown later on historical documents, goes back to exchanges already surmised by the archeologist. The relations between the Greek colonies of the Pontus Euxinus and the interior of Asia extended, according to Herodotus, well within the metallurgical districts of that continent.[20] The so-called "gate of jade" on the western frontier of China gave access among other things to a precious luxury, almost universally sought after in the neolithic period, whose principal source of supply was in the mountains of Kwen-lung.[21] Later, the silk trade made use of the plateaus

[20] *The History of Herodotus*, Book IV, Chap. 23.
[21] Richthofen, *China*, Vol. I, p. 36.

of northern Persia and the long corridors south of the Tian Shan mountains. Wars and political revolutions prevented transit between Syria and central Asia from surviving the age of the Antonines. But the reëstablishment of continental relations which had been interrupted, was undertaken as soon as events permitted. The founding of the Mongolian empire in the thirteenth century led to the organisation, within a few years' time, of direct communication between the Black Sea and North China.

And yet, the chief article of transportation on these natural highways was man himself. He has been able to go pretty much everywhere on earth, either singly or in groups. But in great multitudes migration is possible only when there is adequate means of transportation. Such mobility was favoured by the founding of large pastoral communities upon the steppes. The breeds of animals produced there and the necessity for periodical moves in order to obtain fodder, made final displacements all the easier. The most recent example of such mass migration was in 1720 when the Kirghiz, chased from Zungaria by other tribes, came to settle between the Caspian Sea and the Ural Mountains. It was the final event in a series of invasions by Turks, Mongols, Magyars, Bulgars and Huns, dating back to the Cimmerians mentioned by Herodotus, — periodic spectres, which, with horses and carts, came forth from the world of steppes as from their natural habitat. In the swiftness with which they took shape and the definiteness

of the trajectories within which they appear to have been held, they resemble meteorological phenomena of which science can determine the origins and follow the paths.

But in addition to the steppes, the open plains between Black Sea and North Sea were also for a long time the theatre of migrations. Names such as Scythians, Celts, Cimbri and Teutons, Goths, Germans and Slavs suggest a series of popular movements which ended only with the founding of modern states. At the dawn of history there was already a human flood which has never ceased to flow from central Europe toward the Mediterranean peninsulas.[22] One of the chief consequences of ease of circulation in certain continental regions was that peoples which emigrated were sure to constitute a major part of the ethnographical composition of adjacent regions. Celts and Germans, Turks and even Mongols, were late comers. As invaders and as conquerors they blended with previous populations.

This superiority of continental regions was merely relative. It ceased to exist as soon as the sea became the chief medium of circulation. Inland districts without easy access to the sea straightway fell into a condition of inferiority from which all have not as yet recovered. Circulation at first mainly continental later became essentially peripheral.

[22] Thucydides, Book I, for Greece. — Pliny, *Nat. Hist.*, Book III, for Italy.

CHAPTER II

ROADS

I. LOCATION OF ROADS

Ships slide through the water, the cleft waves roll together, and all trace of the passage is blotted out. But land preserves traces of the routes early travelled by mankind. The road is branded on the soil. It sows seeds of life, — houses, hamlets, villages, and towns. Even what would seem at first glance to be haphazard trails, the random tracks of hunters and shepherds, leave their mark. *Drailles* cross the flanks of the Cévennes. Paths (*gassi*) among the dunes of the Sahara are worn by the tread of caravans. Within the great bend of the Niger there is a network of trails made by passing travellers. In Madagascar paths of porters in the forest are preserved for years in the laterite soil. In the wooded defiles of British Columbia, the trails of half-breed or native hunters were useful to gold prospectors, and sometimes even guided engineers in the location of railways. These narrow ribbons, whose surface is constantly brushed by human footsteps, can already lay some claim to permanence, with an individuality all their own.

Because obstacles are hard to surmount, they are

the chief factor in determining the location of roads, forcing them to follow a given direction. On meeting them, random trails are gathered into a single highway. Rivers, marshes and mountains force the traveller to halt, requiring local assistance and the setting up of new methods of transportation for the crossing. High mountains cannot be crossed except at certain definite points. And so, from one end of the Old World to the other, certain valleys or certain passes early became the routes frequented by merchants, warriors or pilgrims. Sometimes they are hallowed by traces of memorial monuments or survivals of ancient worship. The recently folded mountain chains crossing Eurasia in parallel lines, Alps, Taurus, Himalaya, etc., are accessible only through certain avenues of approach, "gates," as they were called by ancient geographers, by means of which the mountains have always been crossed ever since relations were established between men. Whoever is in possession of these gates has the supremacy. Prehistoric remains mark the lines of approach formerly in use toward Little St. Bernard and Mont Genèvre, both of which were controlled by King Cottius. The ancient kingdom of Cilicia held the keys to Syria, the narrow defiles of Gulek (Cilician gates) adorned with sculptured steles and rock-engravings, evidence of ancient military expeditions before those of Cyrus the Younger and Alexander. The rock inscriptions of Behistun, between Chaldea and Media, bespeak the glory of the Achaemenidae,

just as that of unknown conquerors between Persia and India is related by the carved colossi of Bamian lined up along the defiles of Kabul. In the confusing labyrinth of human migrations these channels serve as reference points. The route of ancient Hellenic and later Slav or Wallachian migrations can be followed across the Pindus, and over the pass of Metzovo which connects Epirus with Thessaly, just as the march of Gallic and Germanic tribes can be traced over the Alps by the Brenner Pass. The valley of Fergana and the gorges of the Terek River explain the distribution of the Persians on both slopes of the chains of central Asia. For a thousand years a Moslem flood has been sweeping over the passes of Kabul into the plains of northern India. The route which crosses the parallel escarpments of the Blue River, the Makong and the Saluen by way of Batang and Tatsing-lu is often no more than a path climbing or running along the edge of the abyss; nevertheless it is the historical bond between China and Tibet, connecting the great oriental civilisation with the Buddhist sanctuaries. America, in spite of its dividing ranges and its Blue Mountains, its celebrated passes of Laramie and Cumbre, has very recent memories to add to this eloquent evidence of history.

The existence of certain definitely fixed points is a pledge of permanence. Doubtless there is no lack of instances of thoroughfares abandoned after having been used for a time. Caravan routes in the Sahara have often changed position; the route

from Nile to Red Sea, established by the Ptolemies, was until recently only an archaeological memory; the route south of the Tarim has perished along with the towns between which it was a connecting link. And yet, men like to use the trails or thoroughfares their forebears trod. Such routes are lines of attraction, to which cling other relations, but of which each section exists for its own sake as well. In the interval between points of arrival and departure, the necessity for food or transshipment determines the location of halting-places at certain definite points along the way. Thus they share in the life which the road creates. If nothing occurs to interrupt the course of these relations, the establishments which have sprung up along highways derive from them both support and a certain degree of permanence.

II. MULE-PATHS AND CART-ROADS

Topography determines the method of transportation, whether beasts of burden or wheeled-vehicles. The cart is useless in mountainous districts where transportation is chiefly on mule-back. The mule, shown harnessed and laden in Assyrian carvings, is one of the most remarkable examples of animal strength and agility in transportation. Stronger than the donkey, more sure-footed than the horse, this bastard product has the monopoly of services which neither the soft-footed camel, nor the yak, carrier at great altitudes, nor the llama, with but a fraction of its strength, can render so well. While in ancient

texts it is described as a draft animal, harnessed to the chariots of great personages, it has since become a beast of burden and a climber of lofty heights. In steep and rugged places where keeping to the narrow path requires constant effort and attention, its services are indispensable. Agility of limb is combined with thick, strong hoofs, which, when shod, are proof against the roughest trails. The minimum space for a laden mule may be as little as a metre and a quarter, while but twice that distance is required for two mules to pass each other.

The mule-path, or as it is well named in Spanish, *camino de herradura*, fits conditions such as the above. So it has become characteristic of certain types of regions. It is the equivalent of the Roman *callis*, found in various widely-separated localities. Without it, many regions would have no means of communication whatever. The peninsulas of southern Europe, the countries of Atlas, Pontus and Armenia, the western borders of China, and finally Spanish and Portuguese America, are its habitat par excellence. The *cavées* or sunken roads of our wooded regions suggest pictures of the pack-trains of mules that used to travel back and forth upon them. Before the Alps, situated in the middle of Europe, had been crossed by international highways, they had their own system, their tracery of mule-paths. It still exists and is especially well developed at heights of between eight hundred and eighteen hundred metres, that is to say, in the agricultural and pastoral

zone, a combination of which pursuits forms the basis of Alpine economy. It is the system of communication which meets the needs of the inhabitants. It connects valleys separated by narrow, transverse gorges (*clues* or *cluses*), or, by way of passes and steep ascents (*monts, monta* in the Alps of Savoy and Dauphiné), pastures clinging to two opposite slopes. This network of mountain trails is confined as much as possible to the upper regions which are its reason for being. In the Hellenic Pindus one may travel far and wide without leaving the heights. The whole system remains aloof, and, even in the Alps, is often poorly connected with the road, — a ribbon gleaming white in the distance at the bottom of an overdeepened valley, separated by steep cliffs from this world of plateaus and upper slopes.

The wheeled-vehicle has, like the mule-path, its own geographical domain. It has been developed in the interior of great continents, in Asia, America and in South Africa where there are considerable areas suitable for its use, thanks to the level nature of the ground. The cart-road has been favoured by regional conditions wherever deposition proceeds at a faster rate than erosion, building up open surfaces only slightly dissected as yet and where infrequent rains leave the soil firm enough to bear the weight of a cart. Dunes and shifting sand are, on the other hand, an obstacle which must be met and overcome between the mountains which often enclose these interior basins. Such surfaces are broad natu-

ral highways, certainly better by far than artificial roads if not kept in repair. Similar open spaces are called *outa* by the Arabs of Algeria. The steppe plateaus between the Tell and the Algerian Sahara, the plain between the Punjab and Delhi, that of northern Syria, the Karoo of South Africa and the pampas of South America, etc., are comparable from the point of view of travel. On the plains which reach from the Black Sea to the Volga between Scythia and Tatary, carts have long been in use. In China and Turkestan a system of vehicular traffic was organised on a large scale. Similar to the Scythian or Tatar cart,[1] the Mongolian *araba* and the Chinese *Tche-tseu*, drawn by four horses and capable of carrying a load of six hundred kilograms, are vehicles suited to this type of road.

Nevertheless, these natural highways which man did not build, have been organised by him for the control of traffic. There are supply-stations every so often. Roads thus take on enough of an entity to assure them permanence. Here and there posts have been discovered which marked the direction of such a route no longer in use, but organised by the Chinese emperors of the Han dynasty in the first centuries of the Christian era, — pillars of stone, placed at regular intervals, and vestiges of reed-fences to

[1] *Relations des voyages de Guillaume de Rubruk. Recueil de voyages . . . , publié par la Soc. de Géog.*, Paris, 1839, p. 205, *et seq.* — The description of the carts of Tatars and Mongolians and their manner of pitching camp, suggests the wanderings of the Boers in their *tracts* across South Africa.

keep off drifting sand.[2] Even today Chinese functionaries still travel from Kansu to Kashgar along such a staked highway with supply-stations at intervals.[3]

And yet it is just such imperfect means of communication as these that have more or less determined world travel. In arid regions water holes and oases served the purpose of halfway stations, dunes and sand being the obstacles which had either to be avoided or crossed as quickly as possible. The staked road, marked by towers[4] at least every ten kilometres, is an improvement upon the rudimentary type of road. It only grazes the surface of the ground, but the ease with which great distances are covered, together with the fact that it requires no upkeep, help explain certain astonishing facts of migration in the history of the great continent of Asia. The ease with which tribes or peoples travel from Zungaria to the Caspian and the system of regular communications established from one end of Asia to the other under the Mongolian empire, all go to show how important a natural aptitude really is, — even of a continent.

[2] Ch.-E. Bonin, *Voyage de Pékin au Turkestan russe par la Mongolie, le Koukou-nor, le Lob-nor et la Dzoungarie*, (*La Géographie*, Vol. III, 1901, I, p. 172).

[3] Highways of Lanchow, Kansi, Turfan, Kashgar, Khotan and Keria (*Mission Dutreuil de Rhins*, F. Grenard, Part II, p. 200).

[4] Λιθίνος πύργος mentioned in the itinerary of Marcus Titianus by Ptolemy.

Similar examples can be found in the New World. The flat prairies between 36° and 35° N., reaching from the Rocky Mountains to the lower Missouri, across which the railway from St. Louis to Santa Fe was built in 1881, were crossed by what was known as the Santa Fe Trail. Over it there was a constant procession of heavily loaded waggons between the Spanish colonies of New Mexico and the first settlements in the western states. The Spanish ox-drawn *carreta* was there in its element. The great trains took seven to eight weeks to cover the distance between the Rocky Mountains and the Mississippi, but already large shipments of goods could be made over distances of more than two thousand kilometres.

Thus primitive modes of travel are branded with the physical environment. Already the superiority of certain regions for circulation and transportation is evident. So they become differentiated from others, and their differences are sufficient to affect intercourse, commerce and even politics.

III. ARTIFICIAL HIGHWAYS. ROMAN ROADS

For a distinct advance in the evolution of means of transportation we must come to the artificial road, the stone-paved *chaussée* as constructed by the Romans. Other peoples, to be sure, Chinese, even Incas, built paved roads; but to the Romans belongs the credit of organising the roads into a system, a network, whose various parts feed into one

another. By becoming a geographical factor, and attracting various activities to itself, this network has helped to determine the fate of nations. It is the application of an idea, originally commercial, to politics. The Roman road is the work of engineers and topographers. Their combination of mortar and stone, rubble masonry and finer concrete of lime and sand, is an actual prototype of our modern roads. It gives regularity and permanence to transportation. It adds a characteristic touch to the landscape. The Roman road, — *Hochstrasse* in Germanic countries, — even though today in part deserted by travel, keeps its original appearance, one is tempted to say, its proud bearing. To avoid crossing streams it preferably keeps to heights undissected by valleys. Over such rounded slopes this narrow band, eight to ten metres wide, doggedly holds to a straight course for dozens of kilometres at a stretch. Local materials were always used, wood sometimes, as well as stone, for while the Appian Way and Latin Way were paved with polygonal volcanic blocks, in Gaul or Germany the bridge which crosses the Rhine at Mainz was built upon a framework of enormous piles. If need be, wooden causeways (*pontes longi*), whose timbers can still be seen half-buried in the peat bogs, were built across the marshes of Frisia or the high swamps of the Ardennes. Even when no longer used for traffic, its stamp is upon the landscape. A fragment of overgrown pavement spared by the plough, which is a dividing line between es-

tates, is a reminder of its existence. Dilapidated and neglected, it is still a sufficient means of communication, for lack of a better. The traveller crosses southern Albania by what remains of the Via Egnatia.

The Roman road is part of a plan. South of Rome the Appian Way continues until it reaches Brindisi, — the Flaminian Way, of which only short stretches remain, ends only at Rimini, on the Adriatic. The Via Aurelia, beyond Arles, is known as the Via Domitia, crossing the district of Narbonne to connect Spain with Italy. Three roads reach the ocean from Lyons, one near Saintonge, one at the mouth of the Seine and one at that of the Rhine. The route from Bavai to Cologne bound together the whole of northern Gaul, preparing the way for the ecclesiastical province of Reims and for the future Picardy. Two opposite seas were put into communication by way of London and Chester. The Roman road is primarily an imperialistic achievement, an instrument of power holding in its clutches a whole sheaf of different, widely separated regions. In many places it is still associated with intimate and living history, because along with commodities, pilgrims or armies, all news of the outside world, all thoughts and legends, have travelled over it as well. Moreover, the populace has given it a name; it has been personified, and for this purpose the most illustrious name in the popular vocabulary has been chosen, — Caesar, for instance, or Trajan, Brunhilda, Charlemagne, and so on.

Towns and villages spring up along its course, as is shown by geographical nomenclature in France and elsewhere: Estrée, Caussade, Septime, Soulosse, Saverne, Taverny, etc. Cities like Reims, Strassburg, Milan and Augsburg, have prospered because they were at cross-roads. Others were established where main highways cross navigable streams, — Lyons, Metz, Cologne, Paris and London. The political and commercial influence of roads has a topographical result, which leaves its permanent imprint even on the arrangement of city streets. Saloniki is traversed from one end to the other by the Via Egnatia, which is its principal thoroughfare. The routes toward north and south, — rues Saint-Jacques and Saint-Denis, — form the minor axis of the ellipse of Paris. In London, Holborn Street and Oxford Street mark the direction followed from the Roman bridge by the Roman road between Dover and Chester.

A zone of attraction as long as there were police, and security was maintained, the road became, if the contrary were the case, a zone of repulsion, a war-path from which the inhabitants withdrew. There was a time, says Thucydides, when because of pirates, cities did not care to locate near the seacoast; they stayed within sight of it, but at a little distance. The same has held true of the roads which anarchy and misfortune surrendered to invaders and highway robbers. That is why, throughout the valley of the Rhône or the Domitian Way, the adjoining heights

bristle with so many fortified towns, cities or villages with walled enclosures, like the *Kasbahs* of North Africa, walls today shattered and crumbling, little, empty streets where everything bears the ear-marks of desertion, but which testify to the sufferings and the perils of other days. However, the towns are not so far removed from the road that they cannot come back to it again as soon as circumstances warrant. But, in certain districts, distrust and suspicion still prevail, and the ancient towns hold fiercely aloof, watching from a distance the ebb and flow of commerce.

The influence of the Roman road has survived the imperial sovereignty of which it was the instrument. It did not serve in vain as means of communication between distant lands. For it was the network of Roman roads which united Italy, just as in Gaul, the network of roads prepared the way for France. Even the countries which did not remain faithful to their conquerors, later developed in accordance with the life-giving system with which Rome had endowed them. The linguistic frontier in Switzerland and in Belgium between French and the various Germanic languages, is obviously connected with the direction of the principal Roman roads, — from Martigny to Avenches and Bavai to Aix-la-Chapelle. In the Balkan peninsula Latin took the place of Greek along the roads between the Adriatic and the Danube.

Defense of the roads connecting the Loire with

the Seine and the latter with the Escaut, was for long the chief concern of the Capetian dynasty, its chief weapon as far as the royal domain and the outside world was concerned. The possession of England was disputed by Saxons and Danes throughout the line of cities and colonies along the Roman road from Dover to Chester, which later became Watling Street.

IV. MODERN ROADS AND RAILWAYS

Only recently, almost on the eve of the railway age, has the systematic construction and maintenance of roads become once more a general practice. The net of royal roads built in France by Colbert, extended later by the Department of Public Works (*Ponts et Chaussées*), was an expression of central authority, exercising its power only from the capital out toward the national frontier. The highways constructed by Napoleon at Mont Genèvre, Mont Cenis and the Simplon, uniting Italy more closely with the rest of Europe, opened a field for new relationships.

The road was the tool used by European colonisation from the very beginning. In Algeria, the barrier obstructing access to the interior was crossed at great expense by the picturesque and impressive roads made famous by the gorges of Chabet-el-Akra or Chiffa. Before the era of railway construction in India, a road had been begun (1851) which was to traverse the entire plain between the passes of Afghanistan and the Gulf of Bengal, a distance of

3000 kilometres. This thoroughfare from Peshawar to Calcutta, — the Great Trunk Road, — was, so to speak, the Appian Way of the New Indian Empire, an imperialistic undertaking, but popular as well, because it facilitated the movements of the Hindu ant hill kept constantly in motion by requirements of commerce or religion, as well as by mere Wanderlust. Before the trans-Siberian railway was built Russia had staked out the route of gold-seekers and political prisoners across Siberia. Between 1811 and 1833 the Federal government of the United States constructed a road called the National Highway across the Allegheny Mountains from Maryland to Ohio, but stopped in Indiana before reaching St. Louis, its original destination.

Such precedents should not be forgotten if one is to appreciate the significance of the great geographical revolution set in motion by the construction of railways.

In Europe the network of roads was the background later overlaid by the railway-net. In France the construction of local roads was greatly stimulated, and the consequent increase in road haulage all drained toward the railways. Nowhere is traffic heavier than in industrial regions such as Lille, for example, where, in addition to a particularly dense network of railways, there is renewed activity on the highways because of other recently introduced modes of transportation such as automobiles, electric railways, etc. Mule-paths still continue to thread

mountainous and other remote districts, and trails to lead in the direction of ancient markets in the steppes. And so, in countries with an ancient civilisation, the machinery of travel due to long-established custom continues to exist side by side with new forms. This fact explains the striking contrast between such countries and regions not previously traversed by age-old travel. Roads lined with trees are part of the landscape of our ancient European countries. Villages at given distances, remnants of former halting-places, are kept alive by passing travel. Sometimes ancient towns, a little dilapidated now, and solitary, are keeping watch at a distance, continuing to survive on the exact spot prescribed long ago by requirements of bygone travel. The location of such markets or small administrative centres was determined by the necessity of making the journey to and fro in one day. A sort of rhythm connected with daily comings and goings governed their distribution. There is no such arrangement in recently settled countries. These are features, among many others, which it is disconcerting not to find in localities where the railway, *proles sine matre creata*, is the only servant and the only master.

Roads had demonstrated their usefulness before railways were invented. They had helped to surmount in part the barrier of the Alps, had opened up Algeria, had crossed the Appalachians, and had completed networks many thousand kilometres in extent. Such developments were but an expression of the

need for freer, more extensive communication, a need apparent in all modern countries. What the road had attempted, the railway was to accomplish. The necessity, even though it did not create, did at least perfect the medium. True, the new method of transportation had still to overcome even greater difficulties. The enormous tonnage was not easily hauled up steep grades. If an obstruction cannot be overcome by means of cuts, tunnels or viaducts, then there must be a series of curves upon valley-walls which make the ascent more gradual. But it is advisable, especially when heavy freight is in question, that these curves should not exceed a rather limited radius. Besides difficulties such as these, — which have been conquered by the engineer at great expense, — there is also in tropical regions, that of seasonal river floods. It is difficult to construct solidly-built bridges across such streams. This gives some regions an advantage, and it is easy to understand why certain countries should make greater progress than others, — those offering the most favourable terrain to this new mode of travel. A great expanse of level plains across which railways could maintain a straight course, a type of soil which would insure the stability of cuts and prevent landslides, as well as flatness of the surface in general, — such were deciding factors. The superiority of the Paris Basin and of our northern plains to the ruggedness of the Massif Central, and to maturely dissected Brittany, became more and more manifest. It was years before the

Massif Central was crossed from one side to the other; the Grand Central Company, so called, could not complete its task and had to abandon its concessions to adjoining lines (Orléans and P.–L.–M.).

In continental Europe, the ease of communication which had favoured the development of the Hanseatic League and the relations between the Rhine and the Elbe (*Hellweg*), appears more clearly than ever in the zone at the foot of the northernmost range of hills in North Germany.

In Russia there is an extended zone of level country, largely between 50° and 55° N. How much less advantageously disposed were the rugged peninsulas of southern Europe in comparison! Their folded chains and active erosion present obstacles to construction and maintenance. Italy has had to spend money and energy fighting the landslides which made it so difficult and so costly to construct across the Apennines of Tuscany the railways indispensable to her unity. Indeed, in proportion as the importance of railways became clear, the difference between the regions which had them and those which had not became more marked, resulting in such a disadvantage to the latter that it had to be overcome at any price. Physical obstacles have ceased to be insuperable. Political and commercial advantage is great enough to attract the necessary capital. Stakes have increased in proportion to profits. Consequently mountains and deserts have been crossed by railways. Mechanical improvements have kept pace. Grades

formerly considered too heavy, 20–25 mm per metre, are no longer impossible. Electrification opens new vistas. And so in the development of transportation, material obstacles are now only relative. They yield to the necessity of uniting the great centres of production, and of improving the economic machinery of a state. Does this mean that physical obstacles have been done away with? By no means. On the contrary, it is noteworthy that crossing mountains by means of long tunnels has added another danger previously unknown on the highway, namely, seepage of ground water.

Many as are the changes brought about by railways they have not done away with the past; they have added to it. Great importance must be attached to what had previously been accomplished by road building. The consequences of road construction can be felt in present economic conditions. For example, modern industry has often been founded on relations which roads brought into being. If many of our industrial cities have been able to maintain their prosperity in spite of the vicissitudes to which their types of manufacture have been exposed, they owe it to their location on roads which have been highways of commerce since time immemorial. Lyons, Milan, Zurich, Nuremberg and Leipzig were originally meeting-places where fairs were held, — markets at the cross-roads. One of the most active industrial zones of northern Germany follows the *Hellweg*, a trade-route which connected the Rhine at its point

of exit from the Schistose Massif with the western bend of the Elbe. Even in England itself, the Black Country had ancient markets which had grown up along the road from London to the Irish Sea.

Thus the fertile soil upon which future developments were to fructify had been gradually preparing. For industrial centres are not created by the presence of fuel and minerals and raw materials alone. The psychological element must be taken into account, that which has to do with habits and customs, knowledge of the outside world, vistas of far-off, distant relationships, finally, with credit and business acumen. All of which were seeds scattered along the ancient thoroughfares.

Herein lies an essential difference between Europe and America.

CHAPTER III

RAILWAYS

I. ORIGIN OF RAILWAYS

The two essential components of the railway, rail and locomotive, have a common place of origin. Rails were first used where there was need of transporting heavy materials. Trucks on rails had been employed in the mines of Great Britain before the steel track was in general use above ground. In the industrial and mining districts of England and Wales the use of steam-power, — at first for pumping water, later for operating machinery, — became more and more general toward the end of the eighteenth century. Extending the mechanical principle of the stationary engine to locomotive and combining locomotive with track, — a feat first successfully accomplished by Stephenson in 1830, between Manchester and Liverpool, after a first preliminary trial between Stockton and Darlington, — are events which are closely related to their place of origin. By a series of operations and discoveries which for more than a century had been going on in the mining and metallurgical districts of central and western England, the perfected invention was prepared in advance, so to speak, and preordained. For it is insep-

arable from certain earlier developments, throughout the course of which the mechanical genius of the race, acting under the compulsion of nature, is plainly to be seen.

The most important of these developments were: first, coal mining on a large scale, the immediate result of its use in smelting minerals; second, substitution of coal for wood, and of steam for water-power; third, increase in production of iron after it had in general taken the place of wood for building purposes. Which goes to show that the chief factors in modern industry were already in the field, forerunners of the subsequent importance of the iron and steel districts. In these natural laboratories, — the mines of Midland, Lancashire, Northumberland and the Lowlands of Scotland, — was heralded the arrival of the age of machinery. In the span of a few years railways were built between Liverpool and Manchester, Manchester and Leeds, Leeds and Bradford, Derby and Newcastle; and in that region the mesh of the railway-net has continually grown finer and finer. Between the railway and the great forces of modern industry there is a mutual relationship, that of cause and effect, which was evident even in its place of origin, — where its birth-certificate was signed.

This connexion is also apparent in continental Europe and in the United States. The first railways were there built in districts with already well-established industries to which was brought additional

activity, — such as the zone of Lyons-St. Etienne and upper Alsace in France, the district of Liége in Belgium, and that of Dresden, Leipzig and Magdeburg in Germany. In like manner, on the other side of the Atlantic, New York was connected with Philadelphia. The new power appeared in all its glory from the beginning. Its development will continue, particularly in regions which have freight in sufficiently large quantity to bring about an economical organisation of commerce, especially in coal-bearing countries such as Great Britain, Belgium, Westphalia and the northeastern United States. In eastern Pennsylvania six or seven railways, known as Coal Roads, exist for the transportation of anthracite. Hardly had the first railway been built in China when Shansi, the land of coal and iron, took the lead. The railway everywhere responds to the appeal of that essentially modern form of industrial activity, — the transportation of minerals in bulk.

II. DEVELOPMENT OF RAILWAYS

Railways obey a law of growth which recalls the increasing speed of a falling body. Beginning slowly, they have spread over the surface of the globe with greater and greater rapidity. The total mileage which, in 1840, was only 7679 kilometres, and which even in 1870, thirty years later, amounted only to 206,000 kilometres, had risen in 1900 to 790,000 kilometres, and could be estimated in 1911

at 1,300,000 kilometres, — more than twenty-five times the circumference of the earth. But even this result gives but an imperfect idea of the transportation facilities at the disposal of men and things, because most of the lines are equipped today with much more powerful engines and the trains are ten times as heavy as they were in the beginning. Power and speed are at least four times as great.

But the network is still far from covering the entire land-surface of the globe; great areas in the interior of Asia, Africa and South America have not as yet been touched. Though in certain localities the pulse is accelerated to fever rate, many others are still isolated, and if not inert, at least persistently loyal to such archaic modes of transportation as originate in the immediate geographical environment. This contrast was formerly much less apparent than now. The present development of transportation clearly emphasises the effect of isolation, by which is meant that isolation formerly did not seem an anomaly, an infringement of general principles. Commerce, which is constantly expanding in its effort to supply the industrial demand for raw materials and the greed for markets, has increased the isolation, not to say created a gulf, between countries within the world railway-net and those still outside. Necessarily great regional differences have resulted.

It is not for us to discuss the social results of railway construction. Their importance is judged to be

so great that, for a quarter of a century, 10,000 to 20,000 kilometres have been annually added to the total mileage of the world. The geographical significance of railways has appeared more slowly. It is difficult for us to comprehend that, during the early stages of development, they were regarded chiefly as means of local transportation. Yet this was the case not only in Europe but in the United States. Both in France and in Germany one takes independent lines between adjoining cities (Paris–Saint-Germain, Lyons–Saint-Etienne, Thann–Mülhausen, Fürth–Nüremberg, Brunswick–Wolfenbüttel, Halle–Magdeburg, Dresden–Leipzig, Petrograd–Tsarskoé-Selo). The first railways constructed in the United States were not part of any comprehensive plan and great difficulty was experienced in connecting one state with another. Building was sporadic and scattering, undertaken to meet local needs. Opinions still differ as to the geographical significance of this new method of transportation. The real conditions under which its influence can be exerted to the fullest extent are not apparent. So long as the railway covers merely short distances, it only adds one more to the numerous means of transportation already available in ancient European countries. Mere increase of speed within a limited radius does not radically alter existing economic relations. Local living conditions can continue just as they have for centuries in response to the dictates of roads and halting-places. For towns, cities or marts have

grown up at points representing the average distance covered in a day, and the latter is stamped on the soil and on popular custom. Interests connected with this earlier method of transportation conspire to encourage its continuance, and actually succeed in retarding railway development, so long as the latter continues to be merely a local affair. Over short distances have not stagecoaches been more than once successful in competition with railways? It is amazing to learn that when railways were first introduced into France, certain cities actually declined the privilege of having one. The fact is natural enough, — without being justifiable, however, — for at that time the advantage of being near a railway and the disadvantage of economic disturbances following its construction were about equally balanced.

The railway is a paying investment only when distance and length of haul can compensate for expense of equipment and construction. Since cost is far from increasing in proportion to mileage, it follows that the greater the distance, the less the relative cost. This is in addition to such advantages as those of speed, capacity and regularity of service. So that, the more extensive the railway system, the more fully are its opportunities realised. In 1835 few were capable of foreseeing future consequences. In France the Saint-Simonian school should receive the credit for having sensed these facts and for having foreseen that future opportunities for the railways were bound up with a vast international system of

communication, including the construction of the Suez Canal.

This early hesitancy is shown in the fact that in 1840 the entire railway-mileage of the world had not yet amounted to more than 7679 kilometres and of this amount France had barely 500, while the United States already had 5000. The example of the United States is illuminating, for the idea of a system was already taking shape there and had begun to be realised. In that new country, in spite of the difficulties presented by local states-interests, the desire to put the inland centres of production in touch with ports was increasing. The large enterprise of the Erie Canal, connecting New York with the Great Lakes, had been completed in 1825, and this had stimulated construction of other canals in Pennsylvania and elsewhere, while numerous steamship companies on the Ohio and the Mississippi were meeting the needs of the cotton-trade and the wish of this restless people to be constantly on the move. But how long would impatient Americans put up with such a lack of speed? One word was on every tongue, "railroad." It became a craze like others in America which now and then travel like a spark along a train of gunpowder. Because of greater speed, capacity and dependability, it satisfied better than river-navigation the fundamental Yankee needs and instincts.

The initial impulse, naturally, came from the large cities of the eastern seaboard, where commerce,

industry and capital were already becoming centralised. Boston, New York, Philadelphia and Baltimore were rival centres. If worst came to worst, river-navigation or the coasting-trade could temporarily supply the factories of the North with cotton. A few tentative lines were projected with that end in view. But the currents of circulation took an astonishing turn, — an emphatically western direction. Beyond the Appalachians, settlements had been made upon the fertile soil of Ohio; coal was being mined at Pittsburgh; Cincinnati had become a live stock market. Every day contacts were becoming closer with the stupendous navigable water-way upon the Great Lakes, two thousand kilometres in length, which is bordered on south and west by vast fertile plains. Enthusiasm never waned from that time on. The urge was toward the west, not toward the south. The swing in that direction began as early as 1835, and before many years had passed, Boston had rail connexion with the St. Lawrence, New York with Lake Ontario and Lake Erie, Philadelphia with Pittsburgh, and Baltimore with the Ohio River.

And so the close relationship between railway development and colonisation was already clear. The progress of the one was regulated by that of the other. An agreement between these two forces of modern civilisation was being signed. If at that time there had been a prophet capable of foreseeing the millions of immigrants which Europe would cast

toward America, he might also have predicted the thousands of kilometres by which those rudimentary railway-systems would have to be lengthened. As early as 1854, in addition to a labyrinth of roads built and extended without any general plan, the chief trunk-lines were beginning to develop in parallel directions. Having surmounted the principal barriers, endless prairie perspectives were unfolding, — while still beyond was a glimpse of the Far West, boundless in hope and aspiration as well as in space!

III. THE CONCEPTION OF A NATIONAL AND STRATEGIC SYSTEM

The ancient countries of Europe had to fight against other obstacles. The labour of many centuries in determining the boundaries of states and the sites of cities had not been without effect. Railways had to adapt themselves to long-established habits of communication, to relations cemented by time, to political groups which had to defend themselves against their neighbours, to nationalities cut on a different pattern and on a different scale from those in America. Each country approaches the subject of railway construction from the angle of its own requirements and its own means. Insular England, whose industries were more advanced than those of the continent and which was more familiar with what can be accomplished by the use of credit, went into construction whole-heartedly, and Birmingham and Liverpool soon were connected,

the chief industrial centre and the chief centre of trade. The Belgian state early connected its capital, as well as Malines, with Antwerp, its fortress. In Germany, the concept of national unity, which Friedrich List, following Goethe, had gained with remarkable insight as a result of the advent of the railway, began to materialise in the construction of lines between chief cities of the great northern plain: Berlin–Stettin (1843); Berlin–Hamburg, Breslau, Magdeburg (1846); Berlin–Dresden–Cologne (1848); and a little later, lines to the south at Nüremberg and Augsburg. As early as 1842 our orators were anxiously denouncing the lines converging toward Cologne, Mainz and Mannheim, concentrating the military forces of the German Confederation.

Russia's first concern was to secure direct communication between her two capitals, and the line from Petersburg to Moscow was built between 1843 and 1851. Not until later did the struggle begin with her chief enemy, — distance. The strategy of self-preservation and defense stood out as a prime necessity in most of our European countries.

Self-preservation is the strongest instinct of every creature, and states are no exception to the rule. When one reads the deliberations of our assemblies in 1842 regarding the construction of our principal lines [1] he is struck by the degree to which they were

[1] A. Picard, *Les chemins de fer français*, Paris, 1884, Vol. I, p. 263.

concerned with strategic considerations. Russia, after going through the ordeal of the Crimean War, hastened to strengthen her inadequate railway-net at obviously vulnerable points. Still more sorely tried by the war of 1870, which had cut away part of our territory, France had to reconstruct her circulatory system with respect to her new frontier, changing and connecting its railways and canals anew. As the fibres of bleeding flesh tend to reunite, France tried to bind up her wound. Again, in order to handle her military forces the more easily and to transport them from one end to the other of her territory, Turkey had undertaken to build the lines from Saloniki to Constantinople, from Scutari to Bagdad, and from Damascus to Mecca, which help to connect the widely separated members of that strong, clumsy organism. Defiant and obstinate, when China finally decided to build railways, she was careful to select as the main artery of her system the route connecting the two parts of the empire, the North and South, habitually alien and dissimilar, Peking and Hankow, or as they were known in the Middle Ages, Cathay and Manzi.

"We believe," said Dufaure [2] in 1837, "that the main lines joining north to south, east to west, and Paris to the uttermost parts of the kingdom, concern not merely commerce, but the nation as a whole." Such was indeed the vision which determined the general layout in 1842. In spite of

[2] A. Picard, *opus cit.*, Vol. I, p. 57.

changes which have been brought about by the lapse of time, that conception still governs the character of the entire French system.

Six lines radiate from Paris as a centre, toward England, Belgium, Germany, Spain at Bayonne, the Atlantic at Nantes, and the Mediterranean at Marseilles. There are two others besides (authorised by the law of June 11, 1842), one from Bordeaux to Marseilles, the other from Lyons to Mülhausen. The underlying idea is that of national solidarity. Branches have grown from this trunk. As nearly always happens, the execution of the plan began with partial franchises, small sections of track. It was soon learned by experience, however, that a rail-system acquires the necessary vitality by mergers and increased mileage. If the mileage in France was but 3625 kilometres in 1851, while seven years later it had more than doubled, and twenty years later had increased almost sixfold,[3] — it was because consolidation of the numerous original companies into six main companies had provided the wide territorial base necessary for the construction and extension of the system. In order to lift and to "set in motion these millions of tons which have lain dormant for centuries,"[4] to quote an orator of 1875, there was needed a lever so powerful that when a

[3] French railways: close of 1851, 3625 kilometres in operation; close of 1858, 8769 kils.; close of 1870, 17,924 kils. (A. Picard, *opus cit.*, Vol. II, pp. 164–5, 554–5).

[4] Cézanne, quoted by A. Picard, *opus cit.*, Vol. III, p. 182.

surplus in one district coincided with a temporary deficit in another, all parts of the intervening territory might feel the effects of the transfer and share in the awakening of activity. To change the figure, there was needed an impetus powerful enough to set in motion the stagnant waters and sweep them off into new currents of civilisation.

This meant progress. And yet the conception of the function of the railway developed slowly, as experience directed. In Europe it took a long time to discover that the revolution brought about by railway construction was due more to the movement of freight than to the transportation of passengers. In discussions about railways in our assemblies this idea seems hardly to have been mentioned. The capacity of the invention for mobilising men was considered, but no one guessed to what extent it would mobilise things! The movement of freight was long secondary to that of passengers in France. As late as 1855 it amounted to but half a million tons.[5] The poor inadequate little stations and yards dating from that period look ridiculous to us.

IV. RECENT EXTENSIONS OF RAILWAY SYSTEMS

Steam navigation has made possible the regular cheap movement of enormous quantities of manufactured goods as well as of raw materials. All methods of transportation had to adjust themselves

[5] C. Colson, *Statistique des transports*, Paris, 1910, p. 104. In 1905 it amounted to 17,500,000 tons.

to increased tonnage. Railways had to enlarge their terminal facilities and to increase the power of their locomotives, rivers and canals to deepen their channels and to widen their locks, ports to develop to an undreamed-of extent. The various modes of transportation coöperated more and more as mileage increased. The development gave rise to so many powerful forces that new demands had constantly to be met with new improvements. To a great extent the function created the organ. *Vires acquirit eundo* is never truer than when applied to railways.

When one compares the very gradual beginning with the headlong acceleration of the last four or five decades, one feels that they are the vehicle for a new force which is generated by such widespread relationships as to be almost universal in scope. It might seem as if most of the European states must have completed their construction by 1875, except Italy and Russia, both of which, however, had gone far toward doing so. And yet, between 1875 and 1910, the mileage almost trebled.[6] As previously remarked, a law comparable to that of falling bodies seems to govern this increase. From 30,000 kilometres (1840–50) it mounted to 69,000 (1860), 101,000 (1870), 162,000 (1880), and 245,000 (1890). There was a slight decrease between 1890 and 1900, but the advance began again with renewed

[6] Mileage in Europe in 1875, 141,700 kilometres; in 1908, 341,100 kilometres (Colson, *Statistique des transports*).

strength between 1900 and 1910. At about the same time the construction of railways in Asia and Africa had been undertaken: in 1854, that of India, which now has a total mileage of 50,000 kilometres; in 1881 the trans-Caspian; in 1891, the trans-Siberian, essential to the Russian system in Asia, which today has a total of not less than 17,000 kilometres; the concession in Algeria was given in 1860 and at the other extremity of the African continent the Cape system had been begun, not to mention lines constructed in Australia and South America.

The total world-mileage which in 1870 was estimated at 206,000 kilometres, today exceeds one million kilometres. Relationships constantly widen as mileage lengthens. The railway shows its superiority and exercises its maximum geographical influence over long distances by through transportation. It may be said, furthermore, that its task is never finished, that a need for expansion is inherent in its nature. Even in the European countries which might seem to have reached the saturation point, extensions and branch lines are constantly being added to meet new economic demands.

France is endeavoring to control the development of traffic beyond her borders, also to make more direct connexion between the chief industrial centres, particularly between the ports which had been left out by the original highly centralised plan.

The closest railway-nets are in western Europe and in the northeastern United States. In Belgium,

northern France and in the southern part of the German plain, there is not a point as much as 16 kilometres from a railway. Having reached such a stage, it would seem as if no further development were necessary. But electricity opens still greater possibilities, especially in industrial districts. A whole new network is grafted on the original one; local railways and suburban tramways are, as it were, the small change which facilitates any transaction. There are but few places in England, Belgium, the pre-Cambrian German plain, northern France, Lombardy, or in Massachusetts where a walk of two kilometres will not bring one to a railway.

Countries where the saturation point seems to have been reached still continue to be the exception. Apart from India and Java, no really complete systems have been built outside the temperate zone. But there is no reason why railways should not extend into and even across arctic and equatorial zones.

Trunk-lines are already being projected inland from the coast throughout the entire periphery of the tropical continents, — in Brazil, East Africa and Western Australia. They enter the arctic zones at Narvik, Dawson City and Archangel. And so a world-system has already been staked out.

The European network is connected by the trans-Siberian with that projected in North China. The United States system enters Mexico by way of two great arteries. There is no connexion between the network of India and that of Asiatic Russia, nor

in Africa between the lines in Algeria and Egypt and those of the Cape, nor in South America between Bolivia and Argentina. But the bridging of such gaps is merely a question of time.

The present state of transportation clearly emphasises the effects of isolation, which, though formerly considered perfectly natural, shocks us today as an anachronism. The rulers of India regard railways as the most effective means of combating famine, — the scourge which periodically destroys millions of their subjects. But our intensive industries, with their avidity for markets and raw materials, are particularly impatient for the opening up of new countries. Their isolation creates the impression of an infringement of rights which must not continue.

For all the above reasons, the railway net is not yet near completion. Ten to twenty thousand additional kilometres a year were constructed during the last quarter of a century. This progress will continue and may have many surprises yet in store.

V. INTERNATIONAL ROUTES IN THE OLD WORLD

One of the most important consequences of the development of a world-system is the forming of relationships which tend to bring about a sort of international economic solidarity.

During the course of centuries of history barriers had been erected between the peoples of Europe, custom-houses set up on frontiers, and each state organised so as to be self-supporting. These tradi-

tional habits have been shattered. It is no longer merely different parts of a single state which must be more closely connected, but regions, which, by reason of their products, are mutually helpful and complementary, whatever their geographical situation or political status. Thus a chain of relationships founded on necessary food-supply has been formed between North America and southeastern Europe. Other relationships are dependent on the mineral or fuel requirements of industry. Great international lines cross Europe diagonally, — a continuation of lines of navigation, — combining into a sort of pan-European system, which, in turn, is prolonged by way of Constantinople into Asia Minor. From Moscow and Samara it plunges into Siberia and joins the Chinese system. Eurasia has communication throughout, from the Atlantic to the Pacific.

Certain routes are favoured by tariff combinations. When it comes to rival maritime routes, whether by ocean or Mediterranean, railways are the deciding element. Antwerp and Marseilles vie with each other for western Switzerland. The powerful German railways are successful, because of special rates, in controlling Mediterranean commerce in Roumania and southeastern Switzerland, being also connected with Italy by tunnels through the Alps. In France, railways called "North," "East," and "Paris-Lyons-Mediterranean" fix their rates so as to attract traffic. The P.-L.-M. lowers them for shipments east of Suez.

An international railway policy is growing up in Europe whose central idea is a drive toward the east, — just as it was a drive toward the west in America.

VI. RAILWAYS AND THE ECONOMIC DEVELOPMENT OF AMERICA

There is no better example of the enormous power of the railway than the United States. Nowhere has the problem of transportation, to use the American word, been approached and solved with greater daring. Before the railway era, attention had been directed toward canals, navigable waterways, national roads even. But only rail transportation made the possibilities of the new world, in many ways limitless, capable of realisation.

Immense, almost uninhabited spaces were disclosed beyond the Appalachian barrier. Only a few embryonic centres of white population had begun to grow up along the Ohio River. Between 1821 and 1915, about 29,000,000 Europeans crossed the Atlantic en route to those virgin lands. That human stream which, for three quarters of a century, has never ceased to flow, though at different rates of speed, is fed by springs at greater and greater distances. Like the Red Nile following the Green Nile in seasonal flood, the stream carries different elements, — Irish at first, later Germans and Scandinavians, and recently Italians, Slavs, and Mediterranean Orientals. But every year from 400,000

to 500,000 human beings are brought to the United States in European vessels. For the last ten years [7] this immense flood has also been invading Canada, where immigration, formerly light, today amounts annually to about 200,000.

This mass of humanity dumped by European steamships upon the American continent, has not been distributed over its surface at random; nor is it sprinkled here and there over these vast spaces as the French-Canadian trappers formerly were. If it has been confined to a few main channels, advancing at a uniform rate so that the centre of population has gradually shifted westward, — it is thanks to the railways. They have served as a vehicle for colonisation. The farther one advanced from the coast into an interior where there were no roads whatever,[8] the more autocratic was the locomotive. It became all-powerful. It gave to the territory it traversed, or which it even approached, the only value which was worth considering in those brand-new countries, that of a means of producing commodities for exchange. The mirage which attracts toward such undeveloped regions a never-ceasing human flood, is no longer a vision of mines of precious metals, but that of produce and wages resulting from a strenuous commer-

[7] From 1901 to 1910 Canada received about one million Europeans, in addition to immigrants from the United States. During the same period the United States itself received about seven millions, the Argentine Republic about one million, two hundred thousand.

[8] The National Highway did not reach beyond Indiana.

cial life. It is no longer a question of living carefully upon a niggardly soil, consuming one's energy in thankless effort, but, after having easily reaped a harvest from an almost virgin soil, to change it straightway into liquid capital; harvests transformed into checks. Such wealth is possible only in the vicinity of a railway. It vitalises whatever it touches. In the still vacant parts of the West the grant of a strip of public lands 32 kilometres wide is a sort of subsidy for the construction of the chief trunk-lines which traverse the United States and the Dominion [9] of Canada from ocean to ocean. And so the companies were provided with a speculative property which, whatever the abuses, has interested them in furnishing, by means of low freight-rates, long-haul transportation for commodities which might feed their traffic.

Whether in the United States, Canada, Argentina or Australia, such commodities were none other than those required by the venerable continent of Europe, either for food, or for raw materials of industry; such, for instance, as wheat, maize and wool from the temperate zone, and cotton, a sub-tropical product. The development of maritime navigation and the regularity and speed of crossings had so reduced the freight-rates between the chief ports on opposite sides of the Atlantic, that the railways had the power

[9] Union and Central Pacific (May 10, 1869), Santa Fe (1881), Great Northern (1883), Southern Pacific (1883), Canadian Pacific (1886), etc.

to tip the balance in rate competition. And this fact was grasped by the commercial sagacity of the Americans. They made a systematic concerted attack on distance. Their power was due to the fact that they were able to fix on the trunk-lines, though not on the local, the lowest freight-rates in the world. Between 1870 and 1900 the average rate was lowered by nearly one third.

This is not merely a natural result of competition; it is the end-product of a series of efforts dating from the period of mergers and amalgamation.[10] The organisation of traffic between centres of production and ports of shipment has the merit of having produced as cheaply as might be, the greatest possible amount of merchandise. Such an arrangement is dependent on constantly fluctuating combinations and estimates depending on circumstances; it is a framework built on foundations which must be watched constantly. The organisation remains sufficiently fluid so that the routes do not become fixed. On account of the greatness of these railway systems, called by the names of the financial magnates who directed them,[11] they have a power whose justi-

[10] This period began about 1890 and was coincident with a great renewal of industrial effort and of settlement, first in the northwest and later in the south. Competing lines were consolidated in systems under a single direction, ending in the establishment of separate systems connected with one another.

[11] Vanderbilt system: Boston to Minnesota, Dakota, Missouri. Hill-Morgan system: the two northern transcontinental lines. Harriman system: Central and Southern Pacific. Gould system: Texas and the Southwest, etc.

fication is the enormous quantity of goods which they have shown themselves capable of handling.

The history of railway disputes, followed by pooling, is still one of the most curious chapters of economic history. But, in the series of misfortunes, other forces than those of finance and speculation are involved. New regions are entering the field with the rapid development and distribution of all the latent riches waiting to be dug from the earth throughout the whole of the American continent, — north as well as south and west, prairies as well as Argentine Pampa, Canada as well as Rocky Mountains. The prairies had been held in reserve, as it were, for an ever-increasing population. When, in the second half of the nineteenth century, those regions were settled, they became a world-granary; the population of the ten prairie states, — with an area three times that of France, — has increased fivefold since 1850; between 1860 and 1880, in particular, agriculture took possession of it up to the very edge of the arid districts. These regions specialised in the cultivation of maize, which has become localised in the five "corn surplus" states (Illinois, Iowa, Kansas, Nebraska, Missouri). They alone raise more than half of the total world-production. As maize suffers from late frosts north of 42°, wheat is the principal crop in Minnesota, the Red River Valley, and farther north, in Manitoba, whence England receives 80,000,000 hectolitres. Those level, easily cultivated plains are able to produce cereals of

uniform quality which can be assembled in bulk for transportation and marketing. Hardly is the harvest over before it is turned into checks for the owners.

When the harvest of maize is insufficient, or threatens to be so in the five above-mentioned states, the Kansas City market is flooded by the arrival of nearly three hundred thousand hogs more than usual. Beside the stations are cattle-pens and grain elevators, necessary auxiliaries for the wholesale storage of produce brought by the railways. And so immense quantities of cereals, wheat, meat and hides are handled by the so-called "Granger Roads" in suitable cars, at extremely low rates, for more than two thousand kilometres, to the ports of shipment for Europe.

VII. RAILWAYS AND DENSITY OF POPULATION

Similar physical conditions throughout great distances constitute a geographical advantage which the railways have made the most of in America. The large-scale structure of that continent lent itself to such a use. It is, in essence, another manifestation of the causes which had already been proved so influential in the expansion of other human societies. In Asia, under like conditions, since time immemorial, the plain of Hindustan and the great loess plateaus of China had shown the importance of mere space as a factor in a large increase in population. It would have been the same in the black-earth belt of Russia if disastrous invasions had not retarded the

development. In the case of America, man took possession of the soil by means of machinery. Whatever additional power manual labour can gain from mechanical contrivances, whatever transportation facilities can add to capacity for production, whatever stimulus to enterprise is given by rapid transit, all, — railways, steamers, telegraph, elevators, steam-ploughs, factories, mining machinery, — all have combined in the development of that vast territory. Thanks to machines, maximum production can be attained with minimum number of workers. Consequently, the rural population of the prairie states, although settled for more than forty years, appears to remain notably smaller than that of the great agricultural districts of the Old World. The density of population in Iowa has stabilised at hardly more than 16 inhabitants per square kilometre, — an average characteristic of the entire region except for great cities like Chicago and St. Louis. Therefore, the railway mileage seems high in comparison with the population, — about 40 kilometres to every 16 inhabitants.

Conditions are not very different in Canada, Argentina and British South Africa. In such recently settled countries the quantity of goods available for transportation is inversely proportional to the number of consumers at hand. It is for the railways to furnish such efficient transportation that producers can operate on a large scale.

If, in great industrial centres, the assembly of

millions or hundreds of thousands of human beings bears a direct relation to rapid transit, railways are also responsible for the immense herds of cattle in Australia, New Zealand and Argentina, which exist for the sole purpose of supplying a few world-markets with wool, hides, horns, meat, etc. Flocks of sheep numbering 60,000, 200,000, even 500,000 head herded by a few men on horseback are hardly less amazing as a spectacle than cities of 500,000 or 1,000,000 inhabitants. In any event, they are facts of the same order of magnitude, hypertrophic both, resulting simultaneously from similar causes. Such assembling of cattle, like the storage of cereals in the prairie states in elevators built to contain thousands of tons, are merely in keeping with the human agglomerations which they are intended to supply. Here is the emporium, — a large city, — there the *runn*, *estancia* or *fazenda*. The size of the market determines the scale of production. Regular transportation in bulk exerts an enormous influence which finds its outlet in one way or another. Produce is concentrated and accumulated by virtue of an economic law which fits rates to the amount of freight to be handled. And it is at this point that the phenomenon takes on a geographical aspect.

VIII. PRINCIPAL ROUTES ON LAND AND SEA

The final phase in the history of transportation is characterised by close coöperation between railways and steam navigation. The welding of continental

to maritime channels of trade tends more and more to occur at certain highly favoured points which acquire thereby the characteristics of world marts. The shipping ports are constituted so as to include the largest possible area in their zones of supply; the ports of entry, so as to serve the largest possible market with the longest possible trade radius.

The two principal groups of seaports are situated opposite one another, on the coast of the United States between 27° and 40° N., and between 40° and 54° N. on that of Europe.

The modern emporium such as New York or London, Boston or Hamburg, resembles the port of old, as pictured by Joseph Vernet, about as much as a steamer resembles a canoe. Such enormous cities, characteristic products of our century, are creatures of the new demands of trade. There information may be had, entrepôts established and contacts made. There is something colossal and excessive about these artificial products, — tonnage of ships, dimensions of harbours, aggregation of docks and factories. Industry seeks to profit by the advantages of ocean transportation for heavy products. Superior facilities seem to be more important than distance, for the modern emporium attracts commodities which, properly, should be shipped from ports nearer their centre of production. A great port has the power to divert them, connected as it is both with the interior and with the seacoast.

Its most obvious function still remains, however,

to establish and cement relationships between international thoroughfares across continents and oceans.

In the economic history of the last century one striking coincidence is unforgettable, the occurrence of two events at an interval of only six months, — the opening of the first transcontinental railway across North America and that of the Suez Canal. The Union and Central Pacific (May 10, 1869), was the first of a series of lines connecting North Atlantic with North Pacific. Twelve years later there were five more lines across the American continent. Far West opened the way toward Far East. Other terminals where railways connected with steamship lines were established in addition to San Francisco, with the added advantage of a shorter crossing, — Seattle and Tacoma in Puget Sound and Vancouver at the extreme end of the railway, 6000 kilometres in length, which receives the traveller from Liverpool at Halifax, conducts him in five days to the Pacific coast, and in ten days more to Japan. Trade between North America and China and Japan is constantly on the increase. Timber from British Columbia, cereals from Manitoba and California oil are in demand in deforested China. There is the same disproportion in population between the two coasts of the Pacific as between those of the Atlantic. But, with the peoples of the Far East, there are too many basic differences for supply and demand to be as easily adjusted as they were between America and Europe. The commercial shrewdness of the North

American is trying to make the adjustment. He is studiously attempting to fit supply to demand, to cajole even Chinese and Japanese as consumers while refusing them as immigrants.

The Far East is connected with world-commerce by another route. When the first ship sailed from the Mediterranean into the Red Sea in November, 1869, thereby realising one of the earliest ideals of Saint-Simon, geographers as competent as Oscar Peschel were far from appreciating the future commercial importance of that thoroughfare. It did not seem possible that such a water route, threading its way between continents from strait to strait, Gibraltar, Malta, Suez, Aden and Singapore, — passing through a series of narrow gateways, easily closed, — could ever rival the commercial supremacy of the great ocean highway around the Cape.

The changes in international relations which were to be brought about by rapid, regular ocean transportation, increased tonnage, and the opening of hinterlands were beyond imagination. By this tortuous route, which touches the most ancient civilised regions on earth and which has its ramifications in East Africa and Australia, European manufactured articles are exchanged for the raw materials of Asia. The latter are not, however, those dealt in by ancient commerce (spices, gold, incense, etc.), which were not harmed by protracted delay in transportation, and could brave with impunity long sea-voyages in the tropics. The articles in demand at the present

time must supply the food and industrial requirements of the huge populations of Europe in large quantities and at fixed seasons. America, to be sure, is also a source of supply, but for prime necessities it would be unwise to be at the mercy of one or two centres of production. The wheat harvest might fail in America, or the cotton crop be insufficient; epidemics or droughts might work havoc among the animals which supply Europe with wool and leather. And, furthermore, is not the population of new countries steadily increasing and are not their industries developing, reducing by just so much their available resources?

Under such conditions, in part unforeseen, the great water-way of the Old World was developed. Items, amounting to about 15,000,000 tons, which pass through the Suez Canal, have been, in succession, cotton from western India, wheat from the Punjab, rice from Indo-China, and tea from South China. And as railway development is pushed toward the north, the oil-bearing beans (*soya*) of Manchuria are becoming articles of trade; soon, perhaps, may be added wheat from northern Manchuria and timber from Siberia.

That the lion's share of the commerce of the Suez Canal should fall to India is explained by the fact that she has the advantage of a well-developed system of railways, dating from as early as 1856. It is certainly a curious spectacle, paradoxical at first, to see so overpopulated a region supplying another

with food. India annually provides Europe, on an average, with 20,000,000 hectolitres of wheat; its wheat and cotton harvests are awaited, discounted every year in advance, and are the chief element of trade for Karachi and Bombay. And yet, though famines are not altogether a thing of the past, their frequency and their effects have in part lessened. Transportation by a fairly well-developed railway system (more than 50,000 kilometres) has regulated traffic in the interior, while connecting the hinterland with seaports. Whatever results have been attained in America by machinery, making up for lack of man-power, have been achieved in this ancient land by the traditional habits of its rural populations. There is a peculiar resiliency in venerable civilisations founded upon that which changes least, — the fertility of the soil, the recuperative powers of the land. That India, with an extensive railway development, and but twenty days distant from Europe, should have a trade amounting to more than 5,000,000,000 francs, two thirds of which is with Europe; that the population of Egypt increased from 6,814,000 to 9,734,000 between 1882 and 1897, reaching 11,287,000 in 1907, while its trade amounted to more than 1,300,000,000 francs, such facts, — in addition to those supplied by Algeria and Tunisia, — are evidence of a vitality which justifies the efforts and hopes which these regions inspire.

It is true that these countries have come under the jurisdiction of Europe. China, which is just

entering the period of experimentation, brings to it an autonomous civilisation, almost untouched, and a mass of habits, interests and prejudices, whose adaptation to a foreign system cannot be achieved without resistance. But in any event, railways have met with success even there, and they may be expected to bring about a closer contact between the two largest centres of population in the world.

IX. CONCLUSION

And so a geographical force is in operation whose effects could not have been foreseen, baffling prediction, surpassing imagination. All these various transit-systems together form a network which is world-wide in extent. Indeed, it includes, if not the entire globe, at least a wide enough area so that almost nothing escapes. Its power comes from an accumulation of its effects. It is the final result of various combinations, in different environments, of rail, ocean and inland navigation. In the United States shipping on the Great Lakes has connexion with railways which receive and distribute its merchandise. In England there has been an extraordinary development of the merchant marine, whose freight consists of coal as a bulk cargo. In the Low Countries and Germany a heavy tonnage on inland waterways penetrates to the very heart of the continent, and freight transportation by rail connects with southeastern Europe. In Africa the great rivers are utilised, — Nile, Niger, Congo, Zambezi, —

with rail connexions to the ocean, as well as between their navigable reaches. Lastly, the attack on central Asia, and, by the Suez Canal, the junction of two spheres of maritime commerce formerly distinct and separate, has been effected. Underneath all the obstacles which have been overcome, is a desire to bring it about that difficulties in the transportation of commodities should be reduced to a minimum, that freight should be transshipped as little as possible, and at least expense.

Between transcontinental railways and ocean navigation it seems as if there were a division of prerogatives, geographical, perhaps, in part. The continents of the northern hemisphere mostly confined between the sixtieth and thirtieth parallels, explain the zonal distribution of railways traversing North America and Eurasia from coast to coast. A continuous steel track extends for more than 5000 kilometres between New York and San Francisco, for 6000 between Halifax and Vancouver, and for 10,000 between Le Havre and Vladivostok. The American continent can be crossed in five or six days, the distance from Paris to Peking covered today in fourteen. Wherever rapid transit is required, by travellers or for mail, transcontinental railways have an advantage over transportation by water.

Ocean routes are preëminently characteristic of the southern hemisphere. From South America to the Cape of Good Hope and from there to Australia and New Zealand, the ocean is the necessary

highway. Driven by the brave west winds, the great sailing-ships, out of sight of land, traverse in twenty-four days the distance between the Cape and Wellington. The Pacific Ocean, across which there has long been a diagonal route from Vancouver to Auckland, has recently another from Panama to Sydney as well. Almost invisible and unknown points in the great ocean wastes (Mangareva Islands, for example) will be, perhaps tomorrow,. international ports-of-call of world-wide importance.

Far from being actual competitors, trade-routes on land and sea really lead to coöperation which strengthens tenfold their hold on economic life. As a result of their deep penetration of remote localities, of the universal making of contacts from which very few regions can still escape, there is everywhere freight to pick up, there are transactions to close and needs to satisfy. And so a new leaven is being supplied and is now at work in every part of the globe.

CHAPTER IV

THE OCEAN

I. ORIGIN OF NAVIGATION

Because of his body with its organs and breathing apparatus, man is a creature of the land, living upon the solid part of the earth. But a domain comprising only one quarter of the surface of the globe would hardly justify the expression 'human geography.' If the land gives man a chance to leave an impression and permanently to establish his works, the oceans, on the other hand, through a series of conquests reflecting the light of human genius, have opened to him unlimited power of circulation. From the invention of the sail to that of compass and sextant, from the first astronomical observations to the calculation of declination tables, there had been a series of discoveries related to maritime navigation. While the hunter's instinct or the mountaineer's experience are transmitted from man to man, in the ocean realm, where throughout enormous distances no place of refuge meets the eye, it is only with the help of science that man has succeeded in discovering the safest routes.

Familiarity with the sea has, however, long been the privilege of only small groups. One cannot

speak of the universal attraction of the sea for mankind because only certain coasts have been attractive: those, for instance, where the ebb-tide daily left bare within easy reach a supply of edible fauna (Tierra del Fuego); those where man found shelter from the miasmic exhalations of swampy forests (northwestern Europe), or where a fringe of islands protects them from the swell of the open sea (Scandinavian *Skiorgard*); those favourable to fishing because of nearby submarine banks (eastern Tunisia, North Sea); or protected seas visited at certain seasons by myriads of migratory fish (Mediterranean). All these causes, and doubtless others, have contributed largely toward bringing some sections of humanity into daily contact with the ocean, which of itself would be rather an object of fear. But, while certain races have been attracted to the ocean, others, like the Persians, have systematically kept away from it, and have expressed their aversion for the hostile element in their beliefs.

The strongest pull exerted by the sea upon primitive man was probably that of its fishing-grounds. Even today, sea-fisheries provide the food for millions of men, from Japan to Norway. The food-supply of the ocean has been the bait by which the landlubber, man, has been drawn toward the foreign element to which he has gradually accustomed himself, and of which he has become the guest, — the boarder, so to say.

The development of commerce led to another

phase: recognition of the advantage afforded by the boundless oceans for long-distance transportation of agricultural or industrial produce at moderate rates. True, wealth can develop only on land; only because there was a Babylon and an Egypt was there a Phoenicia. But it was the ocean which brought the metals of Hesperia and the Cassiteridae to those far-off oriental peoples. Dangers by sea were nothing compared to the obstacles by land. Although in time land transportation has become safe and regular, Russian wheat, English coal, timber from the north, even Algerian wines, still follow maritime routes today because of lower freight-rates. Once merchandise is placed in the hull of a ship, a few hundred kilometres more or less make little difference.

II. NAVIGATION BY SAIL

Utilisation of the mechanical energy of the atmosphere for overcoming the resistance of water, — in other words, use of sails, — contained the potent germ of all future progress. It cannot be said of this invention that it was universal, like fire, for example, for many peoples living near the ocean either had never heard of it, or did not discover it until much later. But those who, independently of one another, began to make use of the invention, gained thereby an early and an immense advantage. They became specialists. This type of life, which strained their utmost effort, became a forge of peoples. Ra-

cial elements, doubtless very unlike, such as Carians and Phoenicians, Malays and Melanesians, possibly Celts and Germans, were combined because of this invention, in such a way as to stamp them with a common character which gives the illusion of a single race.

Whatever the material supplied by local environment capable of harnessing and utilising the force of the wind, — whether plaits of palm leaves or bamboo used by Malays, or linen cloth by Phoenicians and Hellenes, or cotton cloth by Caribs, or leather by Venetians and ancient Celts, — one natural force was met by another natural force, a conquest of nature, an economy of labour and muscular effort. Such peoples gained over others the superiority which comes with greater freedom from material handicaps. On land, the advantage for certain peoples in possessing the horse is conceded; similarly on the high seas, the sailing-ship meant supremacy, from which piracy profited as much as trade.

The peripli and other documents of classic antiquity enable one to appreciate what detailed and minute knowledge of the coasts of the Mediterranean and immediately adjoining seas the early navigators had. A rich nomenclature which overlooks no irregularity or indentation of the shore, invests the coast-line and animates it with picturesque life. Proverbs about much-feared passages are common coin among sailors. Sanctuaries and legends replete with names of the founders of cities

embroider the shores of this inland sea. Sailors are full of such memories. They gave minute attention to the coast, leaving it only with regret and as seldom as possible. But it was necessary to venture out upon the open sea in order to reach Spain and the western extremity of the Mediterranean; for a long time this art was a secret of the Phoenicians, and of the Phocians after them, builders of longer and more seaworthy ships.

But all facts considered, it does not appear that there is any considerable interval between the period of coast-wise navigation and a later period of navigation on the high seas. Everything depended upon physical nature and the system of winds. Even in the Mediterranean, the seasonal north winds which blow regularly from May to October, early connected the Hellenic world with Egypt, and made of the eastern basin a united whole, known even to Homer. Relations were established over even greater distances, — between southern Arabia and Madagascar,[1] and between East Africa and the Malabar Coast. Opposite shores were the more attractive because there was no fear for the return, which was guaranteed by alternate monsoons. Between the coast of China south of Formosa and the coast of Annam, the change from the north winter monsoon to the south summer monsoon has been responsible for establishing relations which are reflected in the name "China Sea." The insular

[1] Alfred Grandidier, *L'Origine des Malgaches*, Paris, 1901.

dikes formed by the Philippines, Palawan and Borneo interfere with the frequently dangerous violence of these winds. The name "Celebes and Jolo Sea" showed that it was a different province. But beyond the areas with a well-known wind-system from which return was assured, were spaces which dangers, enhanced by the imagination, seemed to exclude: such, for example, — south of the region of Arab navigation, — was the much dreaded Mozambique current which bore toward the south with violence.

There was the beginning of a new world. Ancient documents show that navigators from Carthage or Gades, advancing along the African coast with the northeast trades, did not go beyond Sierra Leone. The Atlantic Ocean of the Atlas countries stopped there; beyond was the province of other winds, irregular winds encountered by sailing-ships along the Guinea coast. Frequent tornadoes (arched squalls) make navigation difficult there even today. It requires forty-five days for a sailing-ship to reach Lagos, and but forty-two to reach Rio de Janeiro.[2] This boundary was that of the known world of the ancients.

It should be said that between the eighth and eleventh centuries the area sailed by Norwegian ships which comprised the immense ocean spaces between

[2] G. Schott. *Die Verkehrewege der transozeanischen Segelschiffahrt in der Gegenwart.* (*Zeitschr. der Gesellschaft für Erdkunde zu Berlin,* Vol. XXX, pp. 247 and 279.)

the Hebrides and Iceland across to Greenland and even Labrador, did not overlap the dangerous zone of the Gulf Stream to the south. Those sturdy navigators seemed compelled to follow routes far enough north to avoid the borders of the current which at about 40° N. brings boisterous gales, and which during the winter months is the stormiest zone on earth. The average length of a sailing voyage direct from Europe to America is estimated at forty-two days, and even now, ships leaving Scandinavia continue to stand as much as possible toward the north until they reach Newfoundland.[3] The idea of a northern sea which should include the space between Greenland, Iceland, Scandinavia and Scotland, recurs over and over again throughout the sixteenth century in Danish-Norwegian claims.

III. MARINE PROVINCES

Thus it appears that because of increasing familiarity with the ocean natural boundaries came to be traced and spheres of influence defined. Provinces were marked off in an empire of which the extent was not even known. These areas are not always related, — "schematised," to use Strabo's term, — to the configuration of the coasts; their boundaries are more apt to be those suggested by systems of winds and currents. Location of boundaries is indicated by navigation routes, witness volumes of *Nautical Directions*.

[3] G. Schott, *ibid.*, pp. 273–4.

Supremacy within these maritime provinces has been in part fixed by nomenclature. There is a special terminology. That of the Mediterranean has been mentioned: names are Arabic or Hindu in the Indian Ocean and essentially Scandinavian in the seas north of Europe. Scandinavians, especially, differentiate all the varied types of irregularity in the coast-line: *fiord* designates a long, narrow inlet, *vik* a rounded cove. While the words *ner* and *skaji* are applied to lofty promontories, the second perhaps slightly more elongated than the first, *eyrr* is a flat, sandy moor. The endings *vaag*, *voë*, *kil*, etc., are used for small bays; for islands *ey* or *ö*. A chain of reefs makes a *skiörgard*.[4] Such is the indelible signature affixed by the Norwegians to the seas they have sailed.

The names persist, though little by little the special types of vessels adapted to them are disappearing. Arab *dhow*, large Chinese junk, — which in the time of Marco Polo and of Oderic of Pordenone carried as many as seven hundred men, — platform-pirogue, or double dugout of the Polynesians which excited the admiration of such navigators as Cook and Dumont d'Urville, have or will shortly have taken their places in our nautical museums beside such specimens as the cog of the hanse or the ship (*dragon*) of the vikings. But these archaic

[4] S. Egilsson, *Lexicon poëticum antiquae linguae septentrionalis*, Copenhagen, 1860. Th. Möbius, *Altnordisches Glossar*, Leipzig, 1866.

specimens have played their part in discovery. Great ocean spaces have been traversed by them.

It naturally happened that under the stimulus of competition navigation made more progress in certain provinces than in others. This was particularly true in the Mediterranean: the substitution of the large triangular lateen sail for the earlier square sail was a notable advance. It was a no less marked sign of progress when the Genoese replaced the lateen in turn by more flexible and more manageable sails, thanks to which they could venture upon the open ocean. Thus they are shown in the portolanos as early as the fourteenth century, writing the name of St. George across the archipelago of the Azores.

Each navigation province thus had its individual development, its independent evolution, equipment and personnel.

Conspicuous advance consisted in overstepping individual boundaries and making several provinces into one. When Vasco da Gama, on the voyage which crowned a long and systematic series of efforts, succeeded in reaching Melinda on the east coast of Africa, he there met pilots who knew the route from Calicut and India; and India itself was the vestibule of another much frequented province, that of the Chino-Malayan seas. The spirit of maritime discovery during the sixteenth century could not be explained without such preliminaries. There was a sudden burst of light when all the different provinces

became connected, when the northeast trades, long depended upon for a voyage to the Canaries, had carried Columbus beyond, to the Caribbean Sea, and when at last Cape Horn had been rounded. On the other hand, the results of isolation must not be overlooked, — the immense differences between types of civilisation, whatever they are, when they have developed independently of one another.

The pioneer spirit certainly had not been lacking in the experimental attempts at navigation in many different parts of the globe. But it was characteristic chiefly of Europe, where navigation had gained such a superiority that it encountered little difficulty in the Indian Ocean or elsewhere.

Though the full length and breadth of the ocean began to appear only little by little, as early as the sixteenth century the thought of the oceans as a united whole began to take the place in men's minds of the fragmentary concept in which each province of navigation was a world apart, beyond which one hardly ventured to go.

The ocean became the one great bond of union. It alone was capable of establishing permanent communication at regular intervals between widely separated countries. In order to understand the change of perspective involved, one must recall how rigid was the distinction between Greek and Barbarian, Jew and Gentile, Chinese and all other men. Mankind could now observe itself as a whole, both the traits common to all, and the fundamental dif-

ferences resulting from a long evolution. Though kindly spirit was sometimes lacking, how many contrasts supply food for thought in that extraordinary history! All the good and evil traits of human nature blazed forth as widely differing peoples, separated by an age-old evolution, met for the first time. Religion took upon itself the task of proselyting involuntary infidels and bringing them into a common faith, often showing praiseworthy heroism in the process while practising the most pitiless methods of extermination.

More and more beguiled by the vision of regions admirably suited to become desirable homelands, virgin countries where the transplanted stock of ancient races would be rejuvenated, Europe began to spread abroad, in America, then in Australia and South Africa. New peoples began to multiply, and the ever-increasing exodus had more and more far-reaching consequences. On the other hand, slave-trading was depopulating Africa to supply the plantations of the New World with the necessary labour. And the peoples which had founded federations, empires, or embryo states around the Great Lakes, along the Rocky Mountains or on the subtropical plateaus of America began to disappear. In short, never had there been a more universal upheaval in human relations. The development begun at that time is not yet complete. With the added impetus of modern methods of transportation it can be seen today expanding in an ever-widening circle.

IV. SUPREMACY OF THE SEA

With the fusing of maritime provinces into a limitless blend of seas and oceans, new political perspectives begin to emerge at the dawn of modern times. Dreams of world supremacy, whose realisation has always been balked by the limited areas of continents and geographical boundaries, seem no longer visionary. Sovereignty of the seas seems a possible achievement for a people. A contemporary of Cromwell, Sir James Harrington, found the word to fit the fact: Oceana.[5]

Thalassocracies had already been built up and had disappeared. They generally had as points of departure coasts facing one another or chaplets of islands forming archipelagoes. The Phoenician, Athenian and Carthaginian empires of antiquity, Venice during the Middle Ages, the realm of the Iman of Muscat during the first half of the nineteenth century, — all are samples of this archaic type of maritime supremacy. But these ephemeral structures lacked foundations.

The notion that any supremacy could be established at large upon the open ocean spaces was unknown to Roman law, or rather it was forbidden in advance: "The ocean," so ran the law, "is a thing common to mankind, like air and rain-water."[6] This was no longer the case when, in 1494, Spaniards

[5] J. A. Froude, *Oceana; or England and her Colonies*, London, 1886, pp. 1–2.

[6] *Institutes de Justinien*, Lib. II, Tit. 1.

and Portuguese agreed upon a meridian to divide between them the sovereignty of the seas.

Sailing forth from the mediterraneans, — marginal or continental seas which abound in the northern hemisphere, — passing beyond the great lands' ends, or termini of continents, when the mariner had rounded the Cape of Good Hope and Cape Horn, had crossed the southern seas, and had ventured out into the vast reaches of the Pacific, all the disturbing influences of land upon sea grew gradually weaker and finally disappeared. Not only did endless routes open to view: but seasonal changes, still so pronounced in the middle latitudes of the North Atlantic, faded out entirely toward the south. The ocean-world was uniform to a degree never before guessed. Individual, local needs vanished. Whatever specific equipment or special nautical procedure had been required upon seas bordering and dependent upon continents, was lost, submerged in this amazing uniformity of physical conditions.

In the resulting fury of rivalry and effort to appropriate regions teeming with treasure, — both real and imaginary, — and thereby to gain for one's country sources of unlimited power, such conditions offered to those who should emerge victorious, possibilities of expansion never before imagined.

New ambitions came to light. The notion of supremacy, — an ever-active ferment in political geometry, — expanded to fit the stature of the oceans. The great and powerful continental states

had had painful struggles against difficulties of communication, physical obstacles and the numerous changes and adaptations required by contrasting climates. They had succeeded only with difficulty in surmounting them, and had exhausted themselves in the effort. Their power of expansion had met a stumbling-block in environmental differences augmented by combinations of relief, climate and vegetation. The circum-Mediterranean empire of Rome, in spite of its mighty system of roads, had run into defeat on one side by deserts, on the other by forests and swamps. The Arab empire had not been able to gain a foothold in the agricultural plains of Europe. Expansion of the immense empire of the steppes, founded by Ghengis-Khan, had been stopped by the forests of northern Asia and central Europe.

For a long time the powers had been having a hand-to-hand struggle, because the number of places along the shores available for conquest seemed to be limited, — spicy isles, countries abounding in orchards and fruit-trees or rich in precious metals. The Dutch forged themselves an empire from the Cape of Good Hope to the Sunda Islands at the expense of Portugal, and in the Antilles and Guiana they took the first step toward control of the West Indies. With the addition of spoils from Holland and France, Great Britain in turn built its thalassocracy. It remained for the British Empire to create the first example of world power. Gibraltar, Malta, Aden and Singapore are keys to maritime units which form

a chain along the edge of the continental masses. It embraces, in one immense sweep, India, East Africa and Australia around the Indian Ocean, and Australia, New Zealand and Canada, from one end to the other of the Pacific. Covered by a merchant marine equal to all others put together, the ocean is the bond uniting these possessions. Russia had to make the mighty effort of building the trans-Siberian railway in order to establish, between its various domains, connexions which at best are far less complete. That a universal entrepôt was established at London where, for quite a while, the industries of other nations were obliged to obtain their supplies, is an object lesson, which, for the first time, demonstrated what power ocean transportation could put at the disposal of man.

V. CONTINENTAL REACTIONS

Maritime commerce had at first only grazed the coasts. But beyond the shore where custom-houses and ports had been established a stimulus was given to development of the interior. Natural highways leading from the coast help to facilitate penetration of continents, such as river estuaries navigable for more than a hundred kilometres, or rivers sufficiently large to seem like a prolongation of the sea within the land. If there are no navigable waterways, there are other means by which travel early advanced into the interior.

Thus land and sea began to dovetail. Mere con-

tact between the two worlds, adjacent to one another, was changed to a closer relationship. New life enters by way of the coast. Continents are aroused and animated thereby, because the sphere of influence of cheap transportation, — the chief advantage of water-routes, — is widened, while ocean traffic is increasingly supplied with the cargo of which it is in need. Formerly only the ports shared in the wide overseas perspective. Marseilles, Amsterdam and Hamburg lived their own lives to a certain extent. But today orders come from the interior and also the bulk of produce, raw materials or food-stuffs, of which the ocean is the great distributor; and among many ports competing for freight, one is chosen less for its natural advantages as a port than for its accessibility from the interior. It may then be said that relations between land and sea have been modified by a revolution long under way, but assuming peculiar importance in modern times. Certain advantages to which geography formerly attached great weight, such as a highly indented coast-line, have taken second place, while considerations of location have become paramount. In short, the influence of the ocean has become more widespread; it has invaded continents on a larger scale. Exchange of commodities and men between continents and oceans will henceforth operate over wider areas, in larger numbers.

In physical geography exchanges take place between climates, while in human geography they are

between products. This new state of affairs, a result of progress in transportation and in industry, and the awakening of interest and activity, is naturally reflected on the political map. So many new forces have entered into play that the establishment of a single world supremacy has ceased to be within the possibilities or even the most ambitious hopes of success. Other colonial empires have been founded or are in process of making, in addition to the one which still remains the greatest of all.

In these far-flung political developments maritime positions like those of islands, capes, etc., have their special significance, as is proved by the rôle of Dakar among French possessions, and that which seems assured to Tahiti and Mangareva after the opening of the Panama Canal; or the importance of Hawaii to the United States in the Pacific. They are stepping-stones, relay points, cable-landings, supply-stations for coal or other necessities, ports of call artificially maintained. The source of life is in continental interiors. The influence of the interior upon the coasts is everywhere making itself felt more strongly. It is a significant symbol. The peripheral zone is widening. The sphere of influence of the sea is spreading in the interior. The combination of Hudson, Great Lakes and prairies determined the future of the United States. Delhi has just replaced Calcutta as capital of India; what began as a custom-house has become an empire; the valleys of Ganges and Indus have strengthened the bond between the

coast and a constantly widening hinterland. By way of the Red River, the attraction of Tonkin is beginning to be felt as far as Yunnan and even in Sze-chwan. China and Japan are being drawn into the path of maritime relations. The great expanse of western Africa, from the mouth of the Senegal to that of the Niger, is turning more and more toward the Atlantic, as the converging lines of penetration elicit traffic from the interior. A Congo has taken its place among the states. An Amazonia is beginning to take shape.

As a natural result of this movement, activity is massed or concentrated at junction points. If it were lasting, the present disproportion between the population of certain great maritime entrepôts and the regions of which they are a part might be called hypertrophy. Sydney contains more than half of the population of New South Wales, Melbourne almost half that of Victoria, while Buenos Ayres has almost one fifth that of the immense Argentine Republic!

These facts are all related. The contact-zone between the two elements which divide the earth has widened in both directions; larger land-areas are in touch with larger water-areas. Activity and life itself are stimulated in consequence. There is a greater attraction, one capable of enticing more men away from the soil to which they were attached, capable of marketing entire harvests at greater distances, of moving large quantities of

produce and creating between different lands a bond which heretofore would have been impossible.

Such are the achievements of maritime navigation in our own day. We leave to the reader the task of drawing social and economic conclusions therefrom. They are not to be despised, — and yet, on reflection, all human accomplishment seems trivial, scarcely grazing the surface of things.

When one considers the small area covered by routes of ocean travel in comparison with the immensity of the oceans themselves, especially when one reflects upon what our instruments enable us to surmise as to the physiology and morphology of that immense body, — its abysmal depths, with their great surging movements and the interchanges there operative, and the life which, throughout the entire watery world appears in novel and unguessed forms, — moving legions, floating plankton, creatures crawling in the depths, — one can but be baffled by the insignificant effect of human effort, however notable its geographical results. One perceives in dull amazement how many activities and forces are unknown to us in this world as a whole, in which, with our limited vision, we fancy that we play so important a part. Human activity finds expression chiefly by means of living beings. But what have we accomplished? We have been able to exterminate some species of amphibia which inhabited the northern fringes of the Pacific, to drive the whales from shores which they frequented, but there our

damage ends. We are not even aware of the laws governing the migration of the fish which commonly supply our fisheries. We do not understand their biology. Almost everything below the thin surface layer upon which our presence leaves a momentary trace, escapes us. Almost everything, even what concerns the most venerable occupations and industries of the sea, becomes mysterious when it can no longer be seen. We have but a single weapon with which to probe into this closed world, namely, the mind, armed with science, alert, stimulated today by a clearer consciousness than ever before of the hidden energies all about us. In the world of oceans, as in that of the air, the conquests of the mind and the practical applications to which these conquests have given rise, are the loftiest evidence of the dignity of man.

By them he becomes in truth a citizen of the world. And the changes wrought by science are wonderfully rapid. The Utopia of yesterday is the reality of tomorrow.

FRAGMENTS

FRAGMENTS

I. FORMATION OF RACES

Inasmuch as traces of early man have been found almost everywhere, one must believe in his ubiquity even though not in his universality. Population must have been scattered, because it was nomadic. It must also be thought of as sporadic, that is to say, with blank spaces here and there, areas habitually unoccupied. The arctic regions or fringes of the desert give an accurate picture of such a condition. In hunting and fishing domains the occupied territory consists of small circles dotting the region. Certain hunting grounds are more advantageous at certain seasons and other areas are particularly favourable to fishing. These are undoubtedly the places which man discovered early and which he formed the habit of visiting regularly, where perhaps he began to improvise rude shelters and to mark places for assembling, — rough draughts, so to speak, of the establishments which his great-grandchildren were to build later on. Possibly he may have formed the habit of indicating by definite markers the most convenient routes by which to reach them at a given moment. But, between such rudimentary traces of occasional rendezvous, scarcely more enduring than

the wake of a ship, there must have been large vacant zones, wide spaces habitually empty.

Isolation is the necessary condition of what we call race. If it does not actually create a differentiation it may at least be said that it helps to maintain it. Only with its help have special physical characteristics been developed and transmitted, continuing to persist in spite of subsequent admixtures. But primitive humanity, in so far as we can picture it, seems to have been composed of distinct races, each with its individual, permanent, lasting characteristics which are homogeneous throughout large areas.

We understand race to mean classification based on somatic characteristics, affecting either the morphology or the physiology of the human body. Physically, there are few pure races today; geographically, there are none but thoroughly mixed groups. And yet it is certain that the colour of the skin, cephalic index, nasal index, orbito-nasal index, hair-form and stature, are permanent indications of physical characteristics which once having been differentiated are now established and transmitted from age to age, persisting in more or less pure form in spite of all admixtures. There is no ground for thinking that the Negro, the yellow or the white man, even after a long time, could lose his type characteristics by living in an environment different from his place of origin.

The formation of races should be thought of as

taking place during the earliest history of mankind, and must have been determined by conditions which it is difficult to picture. Population did not spread like a sheet of oil, evenly and uniformly over the surface of the earth. If it did start from a single centre, — which cannot be determined at the present time, — it did not spread equally in all directions. Impossible as it is for us to retrace the steps of this development, we can be sure of but one thing, namely, that at the present time population is distributed in groups. There are a few centres of density between which are open spaces, or at least, regions where the population is far less dense. The causes contributing to the formation of these groups have been favourable to the creation of types. Some have remained weak while others have grown strong enough to include vast multitudes. Without the action of a thousand centuries of differentiating causes it would be impossible to comprehend the present multiplicity of races.

The natural conditions which have interfered with or obstructed the expansion of human groups still exist and to a certain extent are still operative; first, oceans; second, swamps, forests and mountains. Furthermore, there are regions better suited than others for easily and abundantly supplying human needs. The distribution of useful plants and animals must have had a deciding influence upon the formation of human groups.

All the above conditions have certainly changed

since the time when existing races were formed. How can the contradictions and incomprehensible facts of their geographical distribution be otherwise explained?

One such difficult problem, that of the Negritos in southern Asia, has been the object of much study. Sharply differentiated from the races which surround them by their anthropological characteristics, — low stature, woolly hair and brachycephalic index, — they have been found in scattered groups, separated from one another by great ocean spaces, in the Philippines, Malay peninsula and Andaman Islands, and we are not yet in a position to determine their northern and western boundaries. Nothing about the race furnishes an adequate explanation or suggests even a trace of the nautical aptitude necessary to account for such a distribution. What combination of events could possibly explain the existence on islands, scattered over a distance of more than 3300 kilometres, of passive groups unacquainted with any maritime life whatever, and in possession of no other implements than the peculiarly shaped bow which they use for hunting?

Comparative researches carried forward on races of southwestern Europe and northern Africa seem to favour a theory of changes in geographical conditions. Careful students of the Berbers can distinguish a certain number of types representing different races. Among them are some (the brown dolichocephalic leptorrhinian type) which resemble

South Italians, Sicilians and Corsicans; others (brachycephalic) which suggest certain inhabitants of our Massif Central.[1] Possibly the most authentic living representatives of the dolichocephalic, wide-faced race which excavations in the grottoes of the Vézère have made known to us, are found in the mountains of central Tunisia. It might be urged that continental contiguity must have continued long enough to modify certain trends in civilisation. Resemblances between products of paleolithic industry[2] in Europe and in North Africa might be cited as proof.

The hypothesis of extensive changes in the configuration of the continents thus seems indispensable to account for the Negro race. The formation of races analogous to those at present inhabiting southern Europe and North Africa seems to have taken place under conditions not quite so far removed from the present distribution of land and water, but ancient enough none the less. Of the various hypotheses in regard to the formation of the blonde, dolichocephalic race known as Nordic, the most natural seems to be that which connects its origin with the areas from which the Quaternary glaciers in northern Europe had retreated. The purity of race still characteristic of certain parts of Scandinavia, as well as its power of expansion

[1] R. Collignon, *Etude sur l'ethnographie générale de la Tunisie*, *Bulletin de Géographie historique et descriptive*, 1886, p. 203, p. 286.

[2] M. Boule, *Les Grottes de Grimaldi*, *L'Anthropologie*, Vol. XVII, 1906, p. 283.

throughout historic times, are both proof of a relatively recent origin.

A sudden increase in the power of reproduction under conditions of isolation should be considered the origin of a new race. Do such conditions still exist? The Germans in the interior of southern Brazil, increasing from 20,000 to 200,000 in two generations, might be cited as an example; [3] also the Boers in South Africa.[4] But isolation has not been prolonged enough in these cases to have brought about anything comparable to what must often have occurred formerly.

Under the influence of climate in the northeastern United States, a few generations seem to have effected a change in the physical characteristics of the Anglo-Saxon, now called Yankee.

However real such changes may be, they have but a limited range and are not capable of affecting the primordial characteristics of race. Invariability of types is a fact which has been brought to light by progress in anthropological studies. Characteristics which are permanent and those which may change are found side by side. Though we are not in a position to say upon what such a distinction is based, there is not the shadow of a doubt as to the fact. Modification of race is due to mixture rather than to immediate effects of soil and climate upon the organ-

[3] P. Denis, *Le Brésil au XX^e siècle*, Paris, 1909, p. 237.

[4] H. Dehérain, *Le Cap de Bonne-Espérance au XVII^e siècle*, Paris, 1909, p. 135.

ism. Lapps and Scandinavians, Slavs and Samoyeds, Malays and Melanesians, Ainus and Japanese, live together at the same latitudes, while races as different as African Negroes and Indians of South America find their home within the equatorial zone.

The problem of the formation and establishment of certain general types in which many subgroups are absorbed and blended, thus receives little if any clarification from an examination of present conditions. In reality, racial differences go back to a time when the mode of distribution differed greatly from that of today. They must be regarded as a legacy from the past.

There are, however, for reasons still unknown, cases of adaptation so complete that certain races are unfitted to leave certain environments, while other races established in a given environment have the power of either assimilating or eliminating foreign elements. A striking example of the latter has taken place upon the plateaus of tropical America.

It is certain that the typical Yankee, with long, thin neck and smooth, straight hair, has features alien to those characteristic of his place of origin, a fact which perhaps may be related to hydrometric differences. But the peoples of western France, transplanted to Canada, do not appear to have undergone the same modifications. After two hundred years they still remain true to type.

The effects of altitude are less open to question. In Abyssinia and particularly in America, a number

of populations living at altitudes of over two thousand metres, are more civilised than their neighbours in the low, hot regions near at hand. The salubrity of high altitudes is favourable to man. The surgeons of the English expedition to Abyssinia have reported the rapid healing of wounds in that country. But lessening of atmospheric pressure interferes with the combination of oxygen of the air with the corpuscles of the blood, whence the impossibility of prolonged muscular or intellectual effort. Absence of gaiety and vivacity among the Aztecs, even children, and the apathy and want of life in their faces has often been a matter of comment.

Certain races are distinguished from others in the vicinity by their power of resistance, amounting to pathological immunity to certain diseases. An effect of their idiosyncracies is that in the classification of races there is a clearly marked contrast, an incompatibility, between adjoining regions. Malaria drives Chinese and Annamese from the mountains which are the home of Lolo, Moi and other mountain peoples. The *teraï* (swampy area) marks a clear-cut separation between Aryanised Hindu of the plain and Mongoloid peoples of the Himalayan slopes. Only Negroes and half-castes live in the hot low lands (*Germsir*) near the Persian Gulf and no Persians whatever. The Hova of Madagascar leaves the plains to the Sakalave, just as the Chibcha or Quichua of the Andean plateaus has always avoided the dense, damp forests of the *montaña*, or as the

Abyssinian avoids the land surrounding his natural fortress which is either swampy or parched and cracked with heat by turns.

An adaptation which rigidly excludes all newcomers continues to maintain such barriers, but this is true only among backward peoples. The normal condition, of which there are numerous instances, is for different types to live side by side, adjusting themselves to the same environment: Bedouin and fellah, nomad and Ksoorian, Scandinavian and Lapp, Iranian and Kirghiz, Fula (Fulbe) and Mandingo, Bantu and Pygmy.

It should be noted, however, that when neighbouring groups remain distinct it is because the social bond is weak, and civilisation has not developed far enough to blend contrasting elements into one. Under such conditions natural peculiarities which form the basis of habits get the upper hand. It may even be that artificial causes of separation such as that between Mohammedanism and Christianity, tend to perpetuate differences. But on the whole they are signs of a relatively backward social state, in which provinciality has not yet entered into competition with large economic forces which are absorbing into their sphere of influence an ever-increasing number of countries.

Within a small area contrasts marked enough to define habitats of neighbouring races as mutually exclusive are, as a matter of fact, exceptional. Do not climatic zones gradually blend with one another,

the characteristics of each becoming more and more marked as the other is approached? Steppes, savannas and open forest are stages in the transition between desert and silva. Habitats of olive and deciduous trees dovetail, while the presence of particular soils explains the transition from deciduous to northern coniferous forests. The same sort of transition is found between races of men. There are many intermediate types between races whose traits are so well marked that they almost completely fill their own domain, Negro and Caucasian, for instance. But "the extreme difficulty of making a scientific, racial distinction" between yellow and white, spoken of by Dr. Hamy, does not apply to those races alone.

In North Africa Semites, Berbers and Sudanese Negroes are constantly interbreeding. As in ancient paintings of the time of the Pharaohs, the entire scale of light, swarthy, reddish, and black countenances, all are found side by side throughout the entire area between the Mediterranean and the Sudan. Egyptian types blend almost imperceptibly with Nubian, while the latter merge gradually with Bejas in East Africa, or with Negroes of the Upper Nile. Slavery, warfare and Mohammedanism have led to cross-breeding, whose stages, between Arabs and people of Bornu, have been described by Nachtigal. Negro blood flows in the veins of Moroccan rulers. Even the Tuaregs have not entirely escaped its infiltration. Between Senegal and Morocco the peoples known as Moors, — Berbers

with Negro blood, — have a singular resemblance to eastern Ethiopians. So marked is the likeness that it seems as if "at the two extremities of Africa, similar causes had produced similar results and that, from the mixture of two Hamitic races, Nubians or Egyptians, — Berbers strictly speaking, — with some Negro blood, have come heterogeneous groups analagous in many respects. The best examples of such mixed races are found in Abyssinia on the one hand and in northern Senegal on the other."[5]

The fifty million Dravidians in India, located between the Negro races at the south which appear to have been the earliest inhabitants there, and the whites, later comers from the northwest, furnish a somewhat similar illustration. According to good observers, their type "in certain characteristics suggests the Negro and in others the white man."[6] There is "a progressive gradation between civilised Dravidians on the plains and wild Negroids in the mountains." Whatever the mixture, it is a true race, recognisable by certain fundamental qualities which are "remarkably uniform and well-marked."[7] This race belongs in India; it originated there, and better adapted than any other to the climatic conditions, it is the race which sends emigrants to Burmah and labourers to the tea-plantations of Assam.

[5] R. Collignon and J. Deniker, *Les Maures du Sénégal. L'Anthropologie*, Vol. VII, 1896, pp. 268–9.

[6] L. Lapicque, *Ethnogénie des Dravidiens, Comptes rendus des séances de la Société de Biologie*, Vol. LIX, p. 123 (1905).

[7] *Census of India*, 1901, Vol. I, p. 500 *et seq.*

Between the Mongolian races and the powerful Melanesian group, itself so composite, there is a race called Malay, which is great by virtue of its areal distribution and variety. From Sumatra to the Philippines, — not to mention its more distant colonies, — it is par excellence a people of archipelagoes and coasts, particularly given to fishing, piracy and maritime commerce. A Malay type, distinct and well marked, has been formed out of the different elements absorbed; generally speaking, the skin grows darker from west to east as the Melanesian area is approached. There is another transition from south to north, for in the Philippines, even in Celebes, there are individuals who might be mistaken for Japanese.

Conclusion. The causes of the chief racial differences are not known; they are lost in too remote a past. But though caution is necessary because of incomplete knowledge of the facts, there is much to show that human material does preserve its plasticity, and that, under the continuous shaping of the environment, it is capable of taking on new combinations and new forms. Races are always in process of formation. Possible ethnic combinations are by no means exhausted. In nature's crucible countless forces are always at work. And nothing is more profoundly affected by these forces than the intelligent being who knows how to use them for his own ends, to accept their suggestions and model upon them his habits and modes of life. Climate is influential not

only because of its extremes but because of its general character. And climate is not the only factor: soil and topography, surface-forms as well as contacts between land and water, — such is the environment which influences man.

Peoples adapt or, rather, mould themselves to fit the environments where they successively find themselves. The influence of environment is paramount upon half-breeds who are the connecting link between widely separated and widely different races. After all mixtures have taken place, there remains a small residue which is hardy and resistant.

Central Asia, in so far as it is known through exploration, with its Usbeg, Tajik and Dunganes, is a melting-pot of races. In the extreme North of the Old World, as described by Nordenskiold, the influence of this interbreeding has been felt. In Europe, as in Asia, the zone dotted with forests and clearings extending from 50° to 55° north latitude, includes Mongols, Turks, Finns and Slavs. Buriatic Mongols, Mordvinians and Finnish Cheremiss along the Upper Volga are being constantly more and more russified. This phenomenon does not differ from what took place farther west among Germans and Slavs. All such ethnic transformations are continually happening throughout any zone having similar agricultural conditions.

When, by rare good fortune, the light of history enables us to penetrate a little farther into the past, — as in the Mediterranean region, — what do we

find? Evidence of successive arrivals from central or northern Europe. Peoples with such names as Getae, Thracians, Bithynians, etc., descended from the Carpathians to the Bosphorus and from there into Asia Minor. In the eleventh century B. C. the shock of Dorian invasions reverberated from north to south, from one end of Greece to the other. "In Italy," Pliny the Elder tells us, "the Etruscans had driven back the Umbrians before being themselves repulsed by the Gauls." The latter appeared during the third century along the shores of the Gulf of Lions, and later in Spain. From such composite elements nature, after both eliminating and adapting, has fashioned a race which is finally established and is now a part of the environment. New arrivals suffered intensely during the devouring heat of summer and the long droughts, as well as from miasmic exhalations and putrid decay; but out of these different elements following one upon another, an ethnic composite was created, which, without having the character of a homogeneous race, does have certain common characteristics.

II. SPREAD OF INVENTIONS

(Implements and Domestication of Animals)

In the temperate zones one region is preëminently favourable to the spread of inventions and the communication of ideas, namely, the great continental area in the northern hemisphere of the Old World. Tools and implements, in fact all external evidences of civilisation, are the same throughout great distances, — domestic animals as well as appliances, ways of living, food, clothing and habitations. These are large-scale phenomena, covering wide areas, — a fact true long before there were modern means of communication. Circulation was always active there.

This region lies between 25° and 60° north latitude. Most of the inventions basic to civilisation originated there.

The Plough. Take for example an implement whose area of distribution is co-extensive with the Old World, from Mauritania to China, — the plough. South of Aïr in the Sudan, it gives way to the hoe, an implement characteristic of the agricultural populations of central Africa.

This boundary is the outward expression of natural fact; while the area of spade-culture is one in which much food can be produced in a small space,

where trees and roots are the chief products, the plough, on the other hand, could originate only in regions where there is more grass than trees, where the plains-areas are extensive enough to permit of the cultivation of cereals on a large scale.

By what series of suggestions, trials and improvements the pointed stick with which seeds are planted in the ground led to use of a knotty branch attached to a share, — the earliest form of plough, — we shall never know, just as we can never determine the moment when the yoke was fitted to this implement and animals harnessed to the yoke. The ox was used as a draft animal in Chaldea and it is well known what traditional rites are connected with husbandry in China.

In the most primitive specimens of the present time, — the Berber plough, for instance, — all essential elements are present; the ploughshare and the iron jointer are fitted to the beam and to a double handle, of which one half is used by the driver to steer the plough and the other as a pole for harnessing. This simple type early began to be more complicated in certain countries than in others. It is unnecessary to refer to our improved ploughs and mechanical tractors, for as early as the first century A. D., Varro, Pliny and the Latin agriculturists described with astonishment the wheeled-plough in the plains of northern Gaul.

The Wheel. The invention of the wheel was no less epochal. We do not know when nor how the

idea of dragging a burden upon rollers originated; but that ingenious device, although very primitive, seems to have been contemporaneous with use of the wheel, war-chariot, and harnessing of the horse, judging by Assyrian monuments. It was necessary, however, that this primitive form should make way for the wheel, either solid as it is still found in Bosnia and in the Basque country, or built up, as already constructed in early antiquity. When wheels are symmetrically placed at the ends of an axle, it supports the body, and behold a waggon. But, since the moment when this fundamental idea was grasped, what countless modifications and adaptations it has undergone!

The above examples have a double value, first of all a placement value. Next, they are inventions which, whatever their point of origin, have been passed on and improved. (There is nothing of a similar nature in civilisations which have developed in the shade of tropical forests.) Thus we see that over wide distances the spirit of invention has been at work on a common theme, and, without departing from it, has succeeded in making adaptations to various conditions of relief and of soil. And that is where the geographical element comes in again. For in the absence of dates or names, all of which are merely legendary, such inventions do show that natural conditions have moulded the inventions in one way or another, legacies of an immemorial age, but still in use and still capable of improvement.

What is particularly striking is the succession of various improvements focussed upon a given type, a coördinated progress which is seldom met with in the more uniform and less flexible material of most tropical societies.

Transportation by Draft Animals. The moment when animal traction took the place of man-power was crucial in the evolution of society.

Plough and cart presuppose the use of animals. There is no reason for believing, — rather the opposite, — that the use of certain animals for agriculture and transportation was confined to one particular region. There is every indication that the domestication of the docile, social, herbivorous animals upon which rural or pastoral life is founded, took place in many different regions. One gathers, however, that certain localities were particularly favourable. Where could the intimacy which brought together man and the hordes from among which he chose his helpers be better established, aided as it was by mutual curiosity, than on the very threshold of the steppes, where man had succeeded by means of irrigation, in concentrating his resources and in creating wealth? Egypt, Chaldea and the gardens or paradises of western Asia were as favourable to animals as to plants. There man was able to fashion a living world suited to his needs. The acclimatisation of useful plants was systematically practised from remote antiquity: "I made me gardens and orchards and I planted trees in them

of all kind of fruits" (Ecclesiastes, II, 5). For that reason, they were the rendezvous of various animals, centres of attraction for both animals and plants. The attention is thus directed to parts of the earth which are fertile in themselves, but located in the midst of arid regions, and which, as has been said, were the first to become densely populated. Scarcely anywhere else could have been brought about so fruitful a combination, the lack of which in certain parts of the earth, has been a drawback to civilisation.

This region includes all the territory between the Sudan and central Asia, from Nubia to Mongolia, from Persia and northern India to Asia Minor. And so the ancient societies in Egypt and in western Asia owed to their location the great advantage of being able to combine for their own ends the products of two distinct families. From the north they received horse and camel; while the ass came from the south.

III. TYPES OF LIFE AND DOMAINS OF CIVILISATION

Gradually domains of civilisation, the sum of many environments, take shape, — domains with a uniform code of manners which influences usage. Mohammedan, Hindu and Chinese belong to superior civilisations, the imitation of which extends well beyond the limits of natural regions. The European plays an analagous rôle, while the Yankee tends to exert a similar influence in America. As outward appearance is always most easily understood, imitation is apt to be largely superficial. The chiefs of the tribes of Gond, Bhil and other savages of central India, adopt the costume and external appearance of Rajputs in order to impress their associates. In the Sudan, side by side with scantily clothed tribes, are individuals draped in long strips of cotton cloth sewed together, with slippers of red or yellow leather. Such persons are supposed to have some connexion with Islam, therefore to partake of the advantages of a superior civilisation.

The lure of new pleasures, the illusion of a renewal of life by sharing, if only externally, in a superior social state, exerts an unfailing attraction upon groups as upon individuals. It is much the same phenomenon as the exodus toward the city. The effort to appropriate anything from more civilised

neighbours, to assimilate the fruit of the labours of others which has been created outside one's own sphere, is often clumsy and awkward. No matter; any form of civilisation capable of exerting an attraction is a source of energy in itself, independent of immediate conditions of environment. But in order that it may function, one essential condition is mutual knowledge resulting from ease and frequency of communication, in other words, lack of isolation. It was because, as has been noted, such relations were facilitated in the zone which crosses the Old World diagonally north of the tropic, that early forms of civilisation were there developed on a larger scale than elsewhere, — domains ready-made for great empires, as well as for the great religions which there succeeded one another. A long period of synthesis has resulted in the formation of social groups summed up in such words as Islam, Christian Europe, Hinduism, China, — centres of influence which are composed of many lesser centres, but which appear to be homogeneous.

The Chinese, in spite of local differences, remains true to type, whether on the borders of Siberia or in Singapore. Implements, food, medicine and curative methods, as well as luxuries, are material evidence of the fact. China consists essentially of two different countries, North and South, Cathay and Manzi. This civilisation developed in central China. But the Chinese has a common manner of feeding, housing and clothing himself, and of cur-

ing his ailments, or very nearly so, wherever he is. Aspects of his culture are identical throughout great areas, unreceptive as he is to those of his neighbours, Mongols and others. His clothing was formerly made of hemp and cotton, or silk for the wealthy classes. Wool, which would seem to be indicated by the northern climate, was not used. As is customary in hierarchies, archaic in part, dress is elaborate and very beautiful among the wealthier classes. Instead of the short jacket, trousers and sandals, sufficient for the proletariat, opulent bourgeois and mandarins wrap themselves in a sort of long dressing-gown, whose imposing appearance is heightened by embroideries, passementerie and ornaments of jade or crystal. Such things are the external evidence, the enviable badge of social superiority. Side by side with the traditional culture of delicate crops such as tea, elaborate methods such as are required by rice, and the intricate processes of silk manufacture, there are very venerable and elegant industries such as those of porcelain, lacquer, jade, nephrite and bronze which were supplying an extensive trade two thousand years ago. Tea, in the form of bricks, has become indispensable to the peoples of the Asiatic plateaus. Porcelain was among the most ancient articles of trade on the China Sea and the Indian Ocean. Specimens of ancient Chinese celadon are not unusual in the Philippines. They are a material witness to proclaim the prestige of a civilisation as well as its radiating attraction.

Mohammedanism, in a domain won at the expense of the civilisation of the Mediterranean and western Asia, inherited these industries and refinements of culture, — crumbs fallen from the table of the ancient world. Irrigation had been highly developed in Chaldea and in Egypt; the art of enamelling bricks had produced wonders in Persia; the Byzantine dome had been created and industrial arts had become established. In the western part of the Moslem world, the ancient reputation of morocco and the leathers of Cordova may have borne some relation to the very early domestication of the goat among Iberian peoples. The working of hides, tanning, softening and dyeing with various vegetable substances, — samples of which are still found in the bazaars of Africa or of the East, — had long been understood in those districts. Bazaar and caravansary, almost as much as mosque and minaret, from which thousands of voices between the Maghreb and Turkestan call the faithful to prayer, are the organs of this type of civilisation, one of the most tenacious on earth. It is fortified by religious centres such as Mecca, Medina, Meshhed, Samarkand, Fez, Cairo, Kerbela, — where the feeling of solidarity acquires fresh vigour.

On approaching Bokhara, one of the urban centres whose distant fame attracts pilgrims and merchants, long rows of inns and restaurants usher in and lead up to the city. It has often been remarked with what rapidity news, and rumours both true and

false, travel from one end to the other of the Moslem world. Out of all this emerges a force of opinion which opens to the believer not only the perspective of another life, but which even in the present one, heightens him in his own esteem, and makes of him a superior being from the point of view of peoples of the Sudan and even of India. Clothing, buildings, materials and furnishings comprise the external evidence of this Mohammedan civilisation; they show peculiar tenacity. A Bosnian converted to Mohammedanism is usually distinguishable by his dress. It was undoubtedly a mistake to substitute for turban and caftan the fez and scanty coat of the Mahmudian reform.

IV. THE CITY

In certain regions of settled occupation the city has never taken root. The village is the usual type of establishment among the great rural populations of India and the Far East. It is even more dominant in regions of less advanced civilisation such as the Sudan and central Africa. The word "city" could hardly be applied to haphazard agglomerations created at the command of a chieftain, which, when deserted, resemble a hill abandoned by white-ants. But it is the city which prevails in recently settled regions like America or Australia. In Europe, there are both cities and rural settlements, although their distribution varies with the locality.

We are aware that between these two types of establishment there is a difference of kind rather than of degree. It is not a mere question of numbers or of area. A city, in the full sense of the word, is a social organisation of much greater scope; it is the expression of a stage of civilisation which certain localities have not reached, and to which they may perhaps never of themselves attain.

The origin of cities, however ancient they may be, is an essentially historical fact. The mythical halo surrounding their genesis (ritual, eponymous hero, etc.) is merely an expression of the admiration which they have aroused among men. Creatures of

commerce and politics, they accompany the earliest developments of great civilisations: Babylon, Memphis and Susa.

Replacing villages and cantons with cities upon the shores of the Mediterranean was the master-stroke of Greece and Rome. Contemporary observers of this phenomenon, — Thucydides, Polybius and Strabo, — were not mistaken. They describe the πόλις, or ancient city, as the symbol and outward evidence of a superior civilisation. In contrast, they point to peoples which, from time immemorial, have lived in towns or small villages. κωμηδὸν ζῶντες; and this description clearly fits the inhabitants of other parts of the Mediterranean region, who still remain in this quasi-primitive state, as in Albania and Barbary and in certain parts of southern Italy.

What happened in classic antiquity has been repeated over and over again during the course of history. The city, said Tacitus, was unknown in ancient Germany. There have been various periods of city building, — under Charlemagne in Germany, later in Slavic countries, in India at the time of the Mussulman conquests and in the New World after the arrival of Europeans. The elements of the city were there before, but needed an impulse from without in order to combine and make a whole. Before social habits of long standing, strengthened by isolation, could make way for new habits, there had to be glimpses of a broader life.

A study of the growth of cities in the past shows that what made the seed spring to life and guaranteed its growth, was usually an obstacle. At borders of mountain-barriers, at river-crossings, on the edge of deserts, on the seacoast, in short, wherever it is necessary to halt and to find new methods of transportation, there is opportunity for city growth.

There were tribes living beside the ocean in west Africa and southern Asia which seemed merely paralyzed by its immensity. But whenever navigation begins to develop it looks for stopping-places, — small islands close to the shore, headlands along the Mediterranean, *viks* or bays in northern seas. In such places cities grow up. If the tide advances into river-mouths a city is founded at the head of navigation.

At the foot of mountains which have long been an obstacle to human expansion, cities are aligned at points where produce as well as transportation methods, must adapt themselves to new conditions. From Milan to Zurich, and from Vienna to Lyons, a girdle of cities encircles the Alps. Tirnova north of the Balkan Mountains faces Kazanlik, as Vladicavcaz faces Tiflis. Where routes from Kabul descend to the Punjab markets have multiplied.

There is a series of towns along the edge of deserts. Both shores of the Sahara, like those of central Asia, have their ports. After the ordeal of a difficult crossing, caravans there find havens of rest and safety, caravansaries where men and camels

can be recruited, a centre for transactions, a place where men foregather and news is exchanged. Figuig, Timbuktu, Merv, Bokhara, the six cities of Chinese Turkestan, Maan, Petra, — all have played this rôle.

Finally, rivers have also served as an obstacle. Countless cities owe their beginning to a ford or to a crossing facilitated by islands, sometimes to a portage (*volok*), the Celtic *dunum* and *briva*, the Germanic *furt*, etc.

The rôle of highways which has sometimes been overemphasised,[1] certainly should not be overlooked. When Roman roads had made direct communication possible over great distances, their location, in turn, determined the position of cities. Along the Via Aemilia cities succeeded one another from Piacenza to Bologna. While along the great diagonal across the Balkan Peninsula from the Danube to the Propontis, from Singidunum to Byzantium, the only cities at present are those which were founded by Rome: Naissus (Nish), Sardica (Sofia), etc.

For economic reasons villages rise to the dignity of cities in countries where the urban type tends to predominate. The chief industrial regions of Europe have become nurseries of cities. They swarm about Manchester as about Lille, in Saxony as in

[1] J. G. Kohl, *Der Verkehr und die Ansiedelungen der Menschen in ihrer Abhängigkeit von der Gestaltung der Erdoberfläche*, Dresden und Leipzig, 1841.

Rhenish Westphalia. On the other hand, ancient towns, even cities, fall into decay and perish; the process of administration keeps up an artificial existence, where neither habit nor earlier accessibility can protect the antiquated forms from circumstances which conspire against them. The anachronism of Roubaix with the rank of chief-town of a canton is no more unnatural than that of mere country markets with the rank of subprefecture.

If one wishes to observe a riot of urban life, untrammelled, developing with all the vigour of which it is capable, one should look at the United States. There, distance must be overcome and great areas moulded into a single economic district; the only tool to accomplish such results is the city, which is found everywhere. Every new group, however modest, begins as an urban centre. Even in an embryonic state, it already possesses or tends to acquire organs which make it a city, such as hotels, bank, general store. Opportunity will do the rest. American optimism counts on it. Even if the city miscarries, it will disappear without leaving a village behind.

The origin and conditions of growth of European cities have been very different. Time has been an element in their development; their various parts have been added one by one. The ancient cities of Syracuse (Achradina-Tyche-Epipolis), Corinth, Athens (acropolis, lower city and long walls), and

Ephesus (temple and port), are examples of such composite groups, — accretions of time. The same is true of our modern cities.

The core remains more or less distinct: in Paris it is the Cité; in London, the region around the Tower; in Vienna, the quarter of Saint-Etienne; in Rome, the Palatine. To this core new elements have adhered: often the *bourg*, as the Vatican to Rome; the lower to the upper city, in Brussels; and great abbeys like Saint-Germain-des-Près to Paris, and Westminster to London. Next, streets have connected the different quarters (The Strand) and suburbs have grown out like polyps in various directions. The street-plan, tortuous in the old quarters, more regular in the new, in spite of many changes, preserves traces of quarters which have been absorbed in the whole. In Vienna the Ring surrounds a network of little streets lined with cafés and expensive shops; in Berlin the ancient city of the Spree is just as clearly set off from the Friedrichstadt. Sometimes one or two principal thoroughfares, survivals of ancient highways, are the axis along which the city has expanded. In Paris, rue Saint-Jacques on the left bank, rue Saint-Denis on the right bank, follow the direction of Roman roads, which crossed the river in a north-south direction where there were islands, — also rue Saint-Honoré, which led to the Oise and the Vexin. In London, Holborn and Oxford Streets follow the general direction of the celebrated historic highway (Wat-

ling Street) which reached from the ford of the Thames to the west coast near Deva (Chester). At Saloniki, the Via Egnatia is the principal thoroughfare of the city.

Urban unity is sometimes more sometimes less complete. In certain more advanced cities like London and Paris, the composite form tends to disappear. The centuries which have coöperated in bringing about the harmonious development of Paris can still be traced, like the concentric rings of annual growth upon the severed trunk of a great tree. But smaller units have been lost in the greater. This more advanced type is characteristic of western Europe. Moscow has never assimilated its Kremlin. The different quarters are juxtaposed rather than welded together in the great cities of Asia, — Tatar and Chinese city in Peking, Chinese city and European concessions in Shanghai and Canton; commercial quarter and Imperial City in Tokio; Russian city and Persian city in Samarkand.

It took America to create a new type of city. Washington, Philadelphia, Buenos Ayres sprang full grown from a preconceived plan. If the city can trace its history back to the times which from the youthful American point of view seem mediaeval, namely, to the seventeenth century, the original city can still be found, although half-effaced and swallowed up by modern buildings. In Boston it was the hilly peninsula attached to the continent by a narrow neck of land where Washington Street is

today; in New York, the southern extremity of Manhattan Island, south of Wall Street. But today a city may appear suddenly all finished, built everywhere on the same plan. The quadrangular blocks of houses crossed by avenues or trolley-lines have neither local nor historical individuality, whether on the shores of the Atlantic or Pacific, or on the borders of Mexico or Canada. It is a curiously pervasive civilisation which gives them a common exterior. They recall those cities of porticoes, baths and colonnades which the Romans planted impartially in all parts of their empire. But in America the city develops to proportions previously unknown. The various quarters of St. Louis stretch out for more than ten miles. Chicago covers an area larger than the department of the Seine. The American city has transportation facilities which differentiate the various quarters, separating the place of business from the place of residence, introducing between them immense parks, thus creating its rural districts within. "Here the locomotive is like a domesticated animal," said Anthony Trollope as much as half a century ago. What would he say today? Spreading all about itself, pushing out suburbs without end, the city is the perfect expression of Americanism.

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